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ABSTRACT

This handbook gives directions and suggestions for planning and delivering a Math Careers Program for urban women with high school diplomas or General Equivalency Diplomas (GEDs) in a continuing education setting and suggests other settings. The Math Careers Program is designed with a basic assumption that as women's mathematical achievement increases, so do their confidence and comprehension. The goals of the program are: (1) to develop mathematics skills appropriate to one's career choice; (2) to increase awareness of the occupational applications of these skills; (3) to improve one's self-concept; and (4) to broaden one's career aspirations. The Math Career Program can be adapted to high school or college programs, corporate training sites, technical schools, and community-based criminal justice programs. The handbook includes a bibliography of mathematics, counseling, and career information; a 16-week lesson-plan model; eight counseling workshops; and occupational math modules representing traditional and non-traditional careers and a variety of job levels. (MP)

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Beating The Numbers

A WOMAN'S MATH CAREERS PROGRAM HANDBOOK

Women's Educational Equity Act Program
U.S. Education Department

SE 031 920

BEATING THE NUMBERS:

A Math Careers Program Handbook

How to organize a basic
mathematics and counseling
program to help women
improve their job options.

Boston, Massachusetts

Women's Educational Equity Act Program
U.S. EDUCATION DEPARTMENT
Shirley M. Hufstedler, Secretary
Steven A. Minter, Under Secretary
F. James Rutherford, Assistant Secretary for
Educational Research and Improvement

AUG 2 0 1980

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BEATING THE NUMBERS:
A Math Careers Program Handbook

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CONTENTS

Foreword vi
Preface vii

PART I: SETTING UP A MATH CAREERS PROGRAM

Introduction 3
    Beating the Numbers: A Math Careers Program Handbook 3
    Other Settings for a Math Careers Program 4
Planning A Math Careers Program 5
    Needs Assessment 5
    Budgeting 5
    Funding 6
    Cooperative Development 7
    Site Selection 7
    Schedule 7
    Staffing 7
    Organizational Structure 9
Delivering a Math Careers Program 10
    Participants 10
    Orientation 11
    Instructional Components 12
    Student Evaluation 20

PART II: BIBLIOGRAPHY

Mathematics 25
    Occupation-Related Mathematics Texts 25
    Estimation 26
    Films 26
    Games and Puzzles 26
    Math Anxiety 27
    Mathematics Tests 27
    Metric Measurement 30
    Problem Solving 31
Counseling 31
Careers 32
    General Career Information 32
    Career Information for Women 33
    Information on Math-Related Careers 34
    Selected Sources of Financial Aid (Books) 36
    Selected Sources of Financial Aid (Scholarships and Awards) 36

PART III: APPENDICES

A. Recruiting Admission Form 41
B. Class List Form 43
C. Sixteen-Week Lesson Plan Model 45
D. Mathematics Requirements for Three Occupational Clusters . . 63
E. Estimating Skills Unit 69
F. Occupational Mathematics Modules with Information for Instructors 77
G. Counseling Workshops 141

FOREWORD

by Louise Ablondi Bonar, Policy Board Member
Math Careers for Urban Women

Women and math? It is hard to imagine two subjects which are less related. ". . . it is one of those irrational features of our cultural and social structure that a person's sex is, and has been, very relevant to that individual's opportunities in the world of mathematics."[1]

I know the distance between women and math very well. During my days of formal education, I was somehow shortchanged on understanding the importance of math study and appreciating its by-product, the development of a logical thought process. Now I ponder what is to become of us women who inadvertently closed ourselves out of the math-related careers. As luck would have it, these careers now make up that 50% of the job market where expansion is creating opportunities. We read the want ads for technical, management and administrative openings and long for a comfortable working relationship with the basic number sense necessary for budgets and charts.

I believe it isn't too late for us. This belief made me a prime candidate for the Math Careers Program Policy Board because the program clearly links math and occupations and clarifies for the participants the meaning of the term "math-related careers."

In funding this project, the Women's Educational Equity Act Program acknowledged the necessity for a frontal assault on the math anxiety and avoidance of some urban women in an evening continuing education situation. More than 90 women volunteered for this educational experience. More than 50 made it through the program into a new confidence that helped them expand an old job, secure a new one or pass an entry exam into a previously closed educational program. Math instructor/counselor teams at the five sites shared learning problems, homework assignments and career planning with women students who were juggling math study, home and jobs while tromping through Boston's worst winter in 100 years. The transportation was depressing and the attrition was high.

The women who struggled to come formed a network of new friends. These formerly apprehensive women now have an answer for the male critic who scoffed at the idea that special math training could improve women's careers: "Look at Anne Marie going to Technical School, Edna moving from Clerical into Administration and Finance, and Leila arranging math programs for the women in her department so they, too, can develop skill and confidence."

This handbook, Beating the Numbers, shares that Boston experience. It is an educational introduction to the working world that uses mathematics. It is designed for educators in innovative evening or daytime programs who care that women, regardless of educational background, are still earning 57 cents for every dollar earned by men.

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[1] John Ernest, Mathematics and Sex (Santa Barbara, California: University of California, April 1976).

PREFACE

Subtle discrimination in education has resulted from stereotyped assumptions about appropriate study areas for men and women. As a result, many women have not pursued important basic studies in mathematics and have been unable to compete in a job market where mathematical skills are the key factor in an increasing number of occupational areas.

From everyday interaction with adult urban women in Boston, members of Boston Community Schools (BCS)* realized the need to develop a program aimed at helping undereducated and underemployed women overcome mathematical deficiencies. With this concern, BCS invited Boston University's School of Education to collaborate on the planning and implementation of a continuing education program in five Boston neighborhoods. The result was a proposal entitled "Math Careers for Urban Women," aimed at developing and testing a curriculum model that would raise the confidence of urban women by teaching them mathematical skills and occupational uses of those skills in an inviting, non-threatening atmosphere. The proposal was funded by the Women's Educational Equity Act because the program model could be used to assist undereducated and underemployed women all over the United States to learn mathematics and to productively redirect their lives and careers.

BCS and Boston University shared the work of the pilot mathematics program. BCS recruited the participants and coordinated the program; Boston University's School of Education provided the instructors, counselors, and staff who developed the curriculum. The Math Careers Program was piloted in five widely separated neighborhood Boston Community School sites, representing a cross section of Boston residents.

Adjustments were made continuously in the program as problems were identified. For example, since many of the women had full-time jobs, they had difficulties coordinating their work, family, and program demands. As a result, the thirty-week pilot program was reduced to sixteen weeks, and the counseling component was increased.

Beating the Numbers presents the successful results of the Boston Math Careers Program in a how-to format that other community organizations and academic institutions can use to establish their own programs. The authors of this handbook urge careful adaptation of the plan to specific target populations.

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*Through the unique partnership between the neighborhoods and city government, eighteen of Boston's newest school buildings serve as Community Schools on weekday afternoons and evenings during the regular academic year and all day during the summers. Under the general headings of recreation, social service, education, and the arts, the activities of each Community School are designed to reflect the particular needs and desires of its neighborhood residents of all ages. Overall, the program serves some 30,000 children, teens, adults and senior citizens weekly. Each Community School is self-governed by a Council consisting of locally selected, neighborhood-based representatives.

PREFACE TWO YEARS LATER

The news that "Beating the Numbers" has been approved for publication by the WEEA Review Panel started thoughts of many changes in Math Careers Programs during the past two years. The book grew out of a WEEA Program, Boston Math Careers for Urban Women, which taught occupationally related math to math-anxious women. This program showed the willingness of women to overcome barriers to jobs previously inaccessible to women. The program has evolved to Boston Math and Basic Electronics Careers which give urban women the opportunity to train and work in nontraditional jobs after they have prepared themselves with the math/counseling module. Two groups of women and a few men have reviewed and learned math skills, built up confidence, and gone on to an intensive 30-week introduction to electronic circuit testing, repair and maintenance course at Franklin Institute, a Boston technical school. Eighty percent of the first group have well-paying technical jobs; the second group is in the technical study module.

The message is, the program has evolved but the organizational pattern described in "Beating the Numbers" is still viable. The programs continue to start with a neighborhood recruitment through the Boston Community School site attracting women to information nights "down the block." The addition of Bunker Hill Community College, as program host in the second Massachusetts Commonwealth Occupational Education Training grants, broadens the academic possibilities of the current program and increases the resources. The math curriculum is now going through an accreditation process: women who do not go into the electronics module have access to all of the BHCC Open College career and educational outreach resources.

The question I was asked by a WEEA editor: "Wouldn't you like to rewrite the counseling section of "Beating the Numbers?" The answer is yes, and the rest of the book. But I'm not going to. The book as it is written is for people who are beginning to design programs for adults who need to improve their math and learn how to use it in working situations, and who need support while learning. If program goals are these, the book is on target. When the goals change, so should the counseling and math.

Thank you WEEA for the opportunity which the original Math Careers gave me.

Ferol Breymann

Director, Math and Basic
Electronics Careers

Bunker Hill Community College

June 1980

PART I: SETTING UP A MATH CAREERS PROGRAM

INTRODUCTION

Many adult women with high school degrees or General Equivalency Diplomas (GED) have jobs that offer little hope of ecomonic or career advancement because they lack the necessary methematical skills to enroll in company training programs or to pass management-training entrance examinations. Having avoided the study of mathematics in their prior education, these women cannot enroll in an electronics or technical training program, nor can they pass a nursing entrance examination. They cannot train for any craft or job that requires measuring or mathematical accuracy. Furthermore, they cannot advance in any financial area of business, banking, or insurance or in any technical area in a hospital or corporation.

Women who combine mathematics avoidance with low self-confidence are said to be suffering from math anxiety, a widespread social phenomenon currently under intensive national study (see the Bibliography). Women who recognize that they have consciously avoided studying and utilizing mathematics do not necessarily call themselves math anxious; however, they do recognize a need to improve their mathematics skills to better their job and career situations. Building personal confidence and self-esteem may not be an identifiable goal for them initially, but it becomes a welcome result. This handbook contains a plan for assisting these women.

Beating the Numbers: A Math Careers Program Handbook

This handbook gives directions and suggestions for planning and delivering a Math Careers Program for urban women with high school diplomas or General Equivalency Diplomas in a continuing education setting and suggests adaptations to other settings. The Math Careers Program is designed with a basic assumption that as women's mathematical achievement increases, so do their confidence and comprehension. The goals of the program are as follows:

- To develop mathematics skills appropriate to one's career choice
- To increase awareness of the occupational applications of these skills
- To improve one's self-concept
- To broaden one's career aspirations

Several programmatic strategies are useful in accomplishing these goals. These include utilizing a team-teaching concept; maintaining high interaction among instructors, counselors, and participants; and using a variety of teaching modes. These strategies are implemented through the mathematics instruction and counseling components. The mathematics instruction component stresses the practice of basic mathematical concepts and skills useful in certain occupational settings. The counseling component helps women overcome personal and professional barriers that block improvement of their job situations. The real world of work is represented by a realistic assessment of available occupations and the use of role models to reinforce that assessment.

Beating the Numbers: A Math Careers Program Handbook is arranged so that a host organization* interested in a basic mathematics program with counseling support can follow the sequential format and find the necessary resources for implementation.

Part I of this handbook first orients the reader to the program and describes how the Math Careers Program can serve a population of underemployed or re-entry urban women of all ages. Second, it describes the planning phase of the Math Careers Program that a host organization must undertake in order to offer this program. Third, it outlines the delivery phase of the Math Careers Program in terms of identifying participants and program staff and describing the main components of the program.

Part II provides a bibliography of mathematics, counseling, and career information and offers sources of financial aid.

Part III, the Appendices, includes a sixteen-week lesson plan model for presenting basic mathematics in a pragmatic framework, a description of eight counseling workshops, occupational modules created for the pilot program, and other useful information.

Other Settings for a Math Careers Program

The program described in this handbook is derived from an adult evening school pilot program. With slight modification, the Math Careers Program could be applicable to women in other educational settings:

Setting	Application
High School or college	A voluntary tutorial and career awareness program jointly sponsored by school mathematics and counseling departments. The design can be adjusted to higher mathematical levels and applied to professional careers.
Corporate training sites or technical schools	A corporate training program where mathematics skills are a prerequisite for advancement into more technical corporate jobs. Similar adjustments would be relevant for a technical school program.
Community-based criminal justice programs	A program working with women who are reorienting their lives and occupational goals.

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*The term "host organization" refers throughout to the institution or agency administering the Math Careers Program.

PLANNING A MATH CAREERS PROGRAM

The Math Careers Program may be hosted by an organization, such as an academic institution or a community agency, that has educational goals compatible with those of the project and has the capability to generate funds and provide administrative direction. The organization should endorse the team-teaching concept, whereby a mathematics instructor and a counselor cooperatively interact with the participants.

Needs Assessment

The host organization should conduct a needs assesement to include information from prospective participants on mathematics-related jobs held or sought, perceived mathematics preparation needed for employment, possible mathematics courses desired, and time available. Such data may be generated through discussions with community leaders, counselors, employment specialists at a women's center, an evening school registrar, or personnel managers of a business or organization. Alternatively, the host organization may conduct a formal needs assessment by using a questionnaire distributed through women's community organizations, local academic institutions, and/or business and industry.

This information will be useful in designing a program attuned to specific population needs. For example, it can guide the development of the mathematics and counseling content and determine the scheduling of classes, site location, and occupational goals.

Budgeting

A Math Careers Program is relatively inexpensive to operate, since staffing is the only major expense and role models usually donate their time. Teaching materials such as textbooks, calculators, and reproduction costs are variable expenses.

One way of subsidizing some of the costs is to charge a fee, but the amount depends upon the capability of prospective participants to pay. The fee may be for registration or cost of materials and should be collected at the beginning of the program.

Indirect costs will vary, depending on the host organization and the number of participants. Based on urban salaries and costs in 1977-78, the following budget is suggested for twenty participants.*

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*The budget suggested here does not include expenses such as support and custodial services, rent, utilities, and publicity. Be sure to take such costs into consideration if the host institution has not agreed to pay them.

Mathematics instructor 16 weeks at 4 hours per week	$1,000	
Counselor 16 weeks at 4 hours per week	1,000	
Total Fixed Cost		$2,000
Textbooks at $15 per participant	$ 300	
Calculators at $15 per participant	300	
Materials reproduction (occupational modules, problem-solving exercises, puzzles, etc.) at $10 per participant	200	
Total Variable Cost		800
Total Cost		$2,800

A figure of slightly less than $3,000 for a sixteen-week program is a guideline for instructional costs. Thus, at a cost of approximately $150 per participant, an institution can help twenty women move toward satisfactory self-support.

Funding

When a host organization cannot fund a new program from its existing budget, it may be possible to obtain money from other sources. A Math Careers Program is both an educational and a job-training program; as such, interested organizations can look toward public-sector funding from both educational and labor resources. On both the federal and state levels, an increasing number of education programs for women have available funds. Organizations seeking educational funds should explore the categories of:

- Adult or continuing education
- Vocational education
- Anti-sex-bias programs

A Math Careers Program could be funded with federal money under the Comprehensive Employment Training Act (CETA). CETA funds are disseminated by local Prime Sponsors, which are usually city governments or consortia of cities. For the most part, CETA funds are used either to provide meaningful employment training to unemployed people to to give individuals temporary job experience in the public sector. Many Prime Sponsors set aside a portion of their CETA funding specifically for women's programs.

Interested organizations might also look to the private sector for funding a Math Careers Program. Many local foundations, corporations, and businesses have recently prioritized women's programs to receive small donations or operational grants (see the Bibliography).

Cooperative Development

Collaboration with local government, employment counseling agencies, business and/or industry during planning, development, and delivery can prove valuable to a program that has pragmatic, job-related goals for its participants. For example, many governors and mayors have designated staff members, such as a Commission on the Status of Women, to deal with women's issues. Those staffs can be especially helpful in providing political support in obtaining funds and other resources. Public and private employment counseling agencies can help with needs assessment, make referrals for counseling staff and participants, and provide general support of the project Local high schools, colleges, or universities can provide referrals for mathematics instructors and insights into the design of diverse mathematical teaching techniques. Moreover, many businesses and corporations are often willing to assign staff to provide career guidance, recruitment ideas, role models, and places for site visits.

While both the host organization and participants will benefit from such cooperative development during the program, these benefits will also extend beyond program completion when participants seek educational and career opportunities and when the host organization seeks to rerun the program.

Site Selection

Strategic location of the classes is critical. When possible, a site where potential participants already come for meetings or educational purposes is useful for its familiarity. Convenience is another major factor for participants attempting to balance job, family, and education. Attention to room selection is important; the program classroom should permit flexible seating arrangements, ample light, and large chalkboards.

Schedule

Classes must be scheduled for those times when women with work and family responsibilities are most likely to have free time and access to transportation. An early evening time, e.g., 7:00-9:00 p.m., is suggested.

Staffing

The host organization should give appropriate attention to the hiring of mathematics instructors and counselors to ensure that they meet the criteria listed here. If possible, staff should be hired early enough to participate in the program's recruitment and screening phase. If more than one teacher is involved with a Math Careers Program, the staff should meet once or twice a month to share experiences with curriculum content, pacing, teaching methods, student learning difficulties, and ideas for future class sessions.

Mathematics Instructor

A prospective mathematics instructor should have at least a Bachelor's degree and some teaching experience, ideally with adult learners. The instructor should demonstrate a flexible teaching style, patience in dealing with a wide range of student abilities, and empathy for participants. Her/his teaching style should be sufficiently informal to permit several learning activities to take place simultaneously. The instructor must be willing to revise a schedule continuously and to remain with a topic until students demonstrate competency. Some participants may have a limited knowledge of mathematics, while others may have some college-level training. Finally, an instructor from an ethnic background similar to that of the students will probably relate more naturally to the students, as well as serve as a role model.

Counselor

A counselor should have professional experience working with women, as many issues relevant to women's personal lives and careers may have motivated the decision to enroll in the Math Careers Program. Many women may be dealing with personal or family crises, such as alcoholism, drugs, or family violence, while other women may have interrupted careers due to child rearing or marriage. Consequently, sensitivity to and knowledge of personal and career issues faced by contemporary women is a definite requirement for a Math Careers Program counselor. A second hiring criterion should be a background in conducting workshops, as group-process skills are vital. Third, a counselor should possess a wide range of occupational and educational information relevant to jobs and educational opportunities in the community.

It is hightly appropriate for the counselor to be a member of the predominant ethnic group of the participants to foster a sense of identification and self-esteem. If the counselor is from the same geographic neighborhood, her/his familiarity with the local environment will be appreciated by the group.

Finally, it must be noted that conducting group workshops and doing one-to-one counseling on careers and personal issues are usually the work of a professional counselor. Paraprofessionals may serve effectively as information retrievers for women, responding to their requests for occupational and educational information.

Role Models

Role models must be empathetic and knowledgeable of women's struggle in the world of work. Ideally, they should be ethnically and racially matched to the participant population and be of varied ages and stages of professional development. The administrator of the project must determine if a potential role model can:

- Describe the factors (education, experience, decision making) that brought her to her present situation
- Discuss her life style in conjunction with her job, family, and personal pursuits

- Acknowledge solved and unsolved problems
- Present a realistic picture of what it's like to be her

If possible, role models should come from industries and businesses that have cooperated in the project's planning, development, and delivery to further cement the collaborative relationship with the private sector in this program.

Organizational Structure

Because the Math Careers Program involves a team-teaching process and community cooperation, the host organization must be prepared to provide ongoing supervision, training, and liaison with the community.

Relationship to the Host Organization

The host organization should assign one staff member as administrator of the Math Careers Program. This administrator will be the key person who oversees the program's

- team hiring and orientation to the Math Careers Program teaching process
- coordination of cooperative development
- recruitment of participants
- regular meetings with the team
- attainment of role models

Teaming

Team teaching is the use of two or more skilled educators in a given context working in a complementary role. In the Math Careers Program, a mathematics instructor and a counselor work cooperatively for two 2-hour sessions per week. The counselor observes all mathematics sessions and notes the behavior of the women toward the content and the instructor. Reciprocally, the mathematics instructor observes the group-counseling workshops (one hour every second week) to observe participants' non-mathematics-related behavior.

Team members thus acquire a large data base of informal information about the women they serve. Interchanges between the mathematics instructor and the counselor about their observations may assist each professional in allaying participant concerns, bolstering confidence, and understanding individual goals, needs, and interests. This dialogue between professionals is considered an important management and climate feature of the program.

DELIVERING A MATH CAREERS PROGRAM

This section of the handbook outlines activities that must be implemented in order to have a Math Careers Program. These activities include participant recruitment, participant orientation, the program of study, and evaluation.

Participants

A needs assessment will yield a profile of potential participants with respect to work and educational backgrounds, age, and useful data for program design. A sample population may include underemployed working women and/or undereducated women seeking to enter or re-enter the job market. Program eligibility criteria might include interest in skill and job improvement, financial need to work, and educational needs such as training in mathematical computation and comprehension.

Recruitment

Placing announcements in school brochures, church and agency bulletins, local newspapers, and business newsletters is the first step in the recruitment process. The second step is designing and distributing a flyer. Both announcements and flyers should offer an invitation to an informal "Information Night," which is described in the "Selection" section below. Useful sources for recruitment are:

- Women's career counseling agencies; public and private employment counseling centers needing resources for their clients
- Calendar notices in local newspapers, including weeklies (insert a calendar notice and try for a feature article about the mathematics program)
- Public service announcements on radio and television--free and usually effective
- Role models contacted at this stage of program start-up
- Divorce groups in churches or community organizations, including mental health centers, where newly single women may be seeking careers
- Cooperating industries, businesses, and community agencies, especially if they are involved in recruitment and interviewing

Selection

The Information Night provides an opportunity for interested women to visit the program site to ask questions and seek clarification of the program's aims. At that time, the mathematics instructor and counselor and appropriate representatives of cooperating industry and business should be there to answer questions and interview interested women. All cooperating personnel should be briefed about eligibility criteria for participants, participant responsibilities, frequency of classes, length of program, and costs.

Those women prepared to make a commitment to the program that night should be interviewed briefly and registered by completing an application form (see Appendix A) and paying the fee. (The fee is optional--see "Budgeting" section.)

Women wishing additional time to consider enrolling in the program should be provided with an alternative registration date. For many women, the decision to enroll in a program of this nature is a major commitment; they should not feel pressure to register as a result of one exposure.

Overall, screening and interviewing women candidates is time well spent, as it provides assurance of good attendence and a strong commitment on the part of the enrollee.

Orientation

Two important goals of the orientation phase of the Math Careers Program are (a) to establish an emphatic atmosphere between program staff and participants and (b) to clarify the aims, content, and expectations of the program.

For many women, this program will be their first contact in years with formal education, so it is understandable that they may be experiencing anxiety about studying mathematics. Consequently, both mathematics instructor and counselor should be sensitive to participants' needs for positive reinforcement of their oral contributions in a class setting and to their needs for achieving quick successes.

Both mathematics instructor and counselor should be present at the opening session as well as at succeeding sessions. They should begin by introducing themselves personally as well as professionally and by encouraging similar informal information from participants. Initial questions from participants can serve as useful organizers toward covering basic program issues. Whether initiated by student, instructor, or counselor, the following issues should be covered:

Clarification of Program Goals

A brief discussion should describe the kinds of mathematical abilities this program is designed to cover and what reasonable expectations participants should have about the program's utility.

Program Schedule

The Math Careers Program operates for sixteen weeks, or two 8-week sessions with a break, meeting twice a week for two-hour sessions, or totaling four hours a week. Regular attendance is considered an important element for improving mathematics skills and career prospects.

Program Operations

A description of materials to be used should be presented, along with the text. The instructor should orient participants to the layout and special features of the text. It should be emphasized that participants are expected to come to class equipped with pencils, lined paper, and a calculator--either their own or one supplied by the program.

Clear directions telling how class members will be notified in case of a cancellation should be disseminated. A class list (see Appendix B) should be circulated to facilitate communication for the mathematics instructor and the counselor.

Instructional Components

Mathematics Component

The mathematics component of the Math Careers Program comprises seven hours of instruction per 2-week period. The overall goals of the mathematics component are as follows:

- To improve the computational skills of class members
- To introduce/review basic arithmetic operations
- To increase class members' confidence in their ability to apply mathematics to work-related problem solving

To accomplish these goals, this component uses

- flexible teaching techniques
- a textbook with computational exercises
- games and puzzles, estimating skills, and problem-solving exercises to improve logical reasoning
- occupational mathematics modules to apply basic math skills to work-related problems
- a hand calculator to improve mastery of mathematics-related business equipment
- homework

Each of these areas is described more fully below.

Teaching Techniques

Because the Math Careers Program serves participants from a wide variety of educational and job backgrounds, it is reasonable to assume that student expectations regarding appropriate teaching/learning styles will vary. Consequently, the mathematics instructor must be prepared to use a wide variety of instructional styles, including small-group work, one-to-one tutoring, short lectures, individual seat work, and peer tutoring.

Because adult learners are generally self-motivated, ample time should be provided for students to complete work on their own. The instructor should act as a facilitator, providing positive reinforcement to the participant. Women with math anxieties have particular fears about their competencies, a fact which frequently affects their self-esteem. Thus, the mathematics instructor must exhibit both an empathetic and a supportive attitude, coupled with positive reinforcement of successes by sometimes timid learners.

A particular hurdle faced by students with math anxieties is the acquisition and mastery of mathematical language, which is both verbal and symbolic.

The verbal component of math language may be characterized as language with precise, narrow meaning. For example, whereas the word "difference" in everyday language may have varying meanings depending on the context, in mathematics, "difference" refers only to the answer obtained in a subtraction operation when one quantity is compared with another quantity.

The symbolic component of mathematics, e.g., >, =, ∞, creates further problems for the learner because it involves both the acquisition of a definition and the mastery of a somewhat alien or unfamiliar set of symbols. The implications for the mathematics instructor are twofold. First, terms should be kept to a minimum, as it is the logical thought processes of mathematics that one hopes to encourage; and second, when introduced, terms must be clearly explained and practiced in context.

Overall, it must be stressed that flexibility is the key ingredient in the teaching techniques of a Math Careers Program. Note the variety of techniques used in the program's Lesson Plans in Appendix C.

Textbook

Use of a text has practical class management benefits for the instructor, for it permits group focus on the same topic and completion of assignments/tasks at an individual pace. Moreover, use of a text suggests the importance and legitimacy of the course as an organized experience. However, careful attention to the textbook selection process should include consideration of the following issues:*

- Does the text present reading problems for participants? Examine the typeface size, layout, technical vocabulary and organization
- Does the text present practical, career-oriented mathematics? While some participants may be ready for theoretical discussions of mathematics, the main text for the group

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* The text used in the BSC Math Career Program was The Business of Mathematics by Margaret F. Willerding because it satisfactorily met criteria for the pilot program and supplied exercises for hand-held calculators. See the Bibliography for this and other texts.

should address itself to the application of mathematics to one's work life

- Does the text supply exercises suitable for homework assignments and informal evaluation? An answer key (or a partial answer key, with missing answers for the text supplied in the instructor's manual) is useful for the instructor who intends to give varying assignments according to ability and to check group/individual progress through informal in-class work
- Does the text depict women as being involved in mathematics; or does it instead suggest that mathematics is a "man's subject"? Publishers are giving more attention in texts to depicting positive roles for both women and men. Most of the older texts, however, present women in sex-stereotyped roles

Games and Puzzles

For many class participants, basic mathematical terms and operations need only a brief review to clarify or reaffirm understanding, whereas other students having difficulties or encountering a new concept will need more time. Consequently, games and puzzles are enjoyable ways of refreshing class members' recollection of the computation of whole numbers, fractions, and decimals. Cross-number puzzles and solving a mystery statement by performing computations can be engaging activities for small groups or pairs of learners. (See the Bibliography for suggested games and puzzles.)

Estimating Skills

Estimating skills are to be encouraged because of their practical application to work situations. Frequently on a job there are occasions when one must report in global terms, compare two sets of figures, make decisions based on rounded numbers, or check reports or tables for gross computational errors. In such cases, it is appropriate to report or rely on numerical approximations. Class members already use estimation skills informally or unconsciously, and they need to be reassured of the validity of estimating through the program curriculum. An introductory unit on estimating is included here (see Appendix E), and estimating problems are included in the occupational mathematics modules (see Appendix F).

Problem-Solving Exercises

> Problem solving. . .refers to both skills in the application of mathematics and skills in thinking. The process and the product are deemed important. Since it would be impossible to teach any person every application of mathematics that s/he might ever need, the processes involved in reasoning. . .

> in the problem-solving sense. . .constitute an important part of the curriculum.[1]

Problem solving has been used successfully in major university programs designed for students with mathematics anxiety/avoidance (see the Bibliography for the Tobias article) and is incorporated into the curriculum of this Math Careers Program. This technique encourages a high degree of group interaction in brainstorming and encourages risk taking by the participants as they solve a problem together. Emphasis on the process of problem solving helps to erase their "right/wrong" associations with earlier mathematics classes. Moreover, problem solving is not built on formal terminology, so participants with a limited mathematics background may participate in working through problems.

A book that may be used successfully with a similar population is Successful Problem-Solving Techniques by Carole Greenes et al. (See the Bibliography for this and other problem-solving citations.) This text offers a good orientation for instructors and a wide variety of simple problems for students, with replication of text pages permitted.

Occupational Mathematics Modules

An innovative feature of the curriculum in this handbook is the inclusion of occupational mathematics modules that are units of instruction featuring mathematics-related tasks of occupational clusters. The three occupational clusters--Business and Office, Marketing and Distribution, and Technical--are included because of favorable job forecasting in these clusters. The mathematics included in the modules is the result of an analysis of the mathematics needed for these particular cluster occupations. (See Appendix D, "Mathematics Requirements for Three Occupational Clusters.")

The occupational mathematics modules represent a cross section of traditional and nontraditional careers and a variety of job levels. In each instance, the criteria followed were:

- Presentation of a female role model demonstrating positive work attitudes, long-range career goals, and competence in the completion of tasks
- Stress on the utility of basic mathematics through exercises calling for completion of job-related tasks
- Opportunities for class members to demonstrate/share their decision-making competencies in the solution of work-related problems

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[1] Carol Greenes et al., Successful Problem-Solving Techniques (Palo Alto, California: Creative Publications, Inc., 1977).

Activities in the modules can be completed either in class time or as homework because they stand alone as self-sufficient units, with directions enclosed for class members. The "Information for Instructor" section accompanying each unit provides:

- answers to the tasks of the modules
- suggestions for additional activities
- additional occupational information

Hand Calculator

A hand calculator is recommended in the Math Careers Program because familiarily with its use is a practical business skill. The text and occupational modules both incorporate use of a hand calculator, so the instructor should be prepared to spend extensive time explaining the uses of the calculator to class members. Individualized assistance is recommended. Estimating the results prior to using the calculator is a good practice; it helps to determine errors and prevents one from becoming dependent on its use.

It is also recommended that the same calculator model be used by all class members to facilitate ease of explanation and subsequent class use. The cost of the calculator can be borne by the host institution, depending on the funding, or by the participants if they are paying a course fee. Since this has budgetary implications, decisions pertaining to the use of a hand calculator should be made early.

Homework

Short homework assignments--e.g., exercises from the text, portions of occupational modules, puzzles--should be assigned regularly. The instructor should impress upon class members the need for regular completion of assignments to facilitate learning and to obtain feedback regarding their individual progress. At the same time, however, the instructor should be sensitive to the diverse career and personal responsibilities which may sharply curtail the time available to women for completion of assignments.

The instructor should informally check that homework is completed, but should avoid assigning a grade since competitiveness among class members is not encouraged in this program. Where homework is assigned, the instructor should provide for class time in the next session to review it. The instructor might:

- ask group members to suggest different homework problems requiring group attention and then solve them at the board
- encourage pairing of weak and strong members around discussion of a specific operation or concept for peer tutoring

- have volunteer students demonstrate solutions to small groups
- work with individuals on obstacles to homework completion

Formal or informal attention to homework assignments by the instructor can provide valuable data regarding an individual class member's progress.

Counseling Component

The counseling component comprises one hour of group counseling per two-week period, with one-to-one counseling on an intermittent basis (see Appendix G, page 141, for the format of the eight counseling workshops). The overall goals of the counseling component are as follows:

- To help participants clarify and plan meaningful educational and career goals
- To help participants see themselves as productive workers
- To help re-entry women with the special activities of finding and keeping a new job
- To provide constructive resources to assist women in areas of confidence, job search, etc.

To accomplish these goals, the counseling component uses the strategies of:

- one-to-one counseling on work, educational and/or personal issues
- group workshops on themes of relevance to a population of adult women
- role models

All of these aspects of the counseling component are described more fully below, along with a description of counseling issues and services.

Orientation

An important feature of both individual and group sessions with participants is a clarification of the functions of the counseling component. Many of the women will bring to these encounters misconceptions about counseling, including beliefs that:

- counseling is therapy (counseling is "therapeutic" and helpful, but not analagous to deep therapy)
- counseling is an intrusion into their personal lives (the only personal issues the counselor deals with are ones raised by the women themselves).
- counseling is a cure-all for all their problems, including every issue they face related to the program (it may provide remediation of some problem areas, but counseling certainly cannot solve everything)

Given the wide array of misconceptions possible, it is important to clarify that counseling is:

- help with the clarification and implementation of educational and career goals
- an opportunity to alleviate anxieties about oneself in the work world
- a supportive environment in which to think through, share, and debate possible plans and recent undertakings
- a way to practice and sharpen new skills for work and educational contexts

It is important during the orientation phase for the counselor to be frank, firm and reasonable, but not didactic in stressing these points. Reinforcement of reasonable expectations for the outcome of both the counseling component and the program as a whole will be necessary with individuals for whom stereotyped preconceptions of counseling are deeply entrenched.

The orientation phase is also an important time in the life of a group to attend to climate issues. This includes establishing a safe environment for women, in terms of both their relationships with each other and with the counselor. For that reason, at least the initial one-to-one meeting and the first group workshop ought to be cautious and exploratory to insure that the counselor does not cross the personal space boundaries of class members. Clarification of the goals of the counseling component and of the role of group members in making/helping things to happen will alleviate some of the participants' anxieties.

One-to-One Work

The counselor should be available to women before, during, and after mathematics classes to maximize the participants' opportunities to speak frankly to the counselor on a one-to-one basis. Opportunities are available in class when a member is doing individual seat work or when familiarity with a specific concept will permit a brief absence while a lecture or small-group activity is taking place. Of course, the exiting and re-entering of women from the class may be disruptive to the mathematics instructor, so the counselor and instructor should negotiate a mutually satisfactory means of facilitating class members' movements.

The one-to-one work of counselor and individual participant may entail a wide variety of counselor services, including:

- administering vocational inventories
- providing job or job-hunting information
- constructing a resume
- providing educational information
- discussing personal problems (if this is requested and if the problems are related to career planning)

Initial one-to-one sessions are primarily geared to helping the counselor and participants get to know each other. Thereafter, one-to-one sessions should be largely responsive to the needs articulated by the women, as opposed to being initiated by the counselor. Specific appointment times will make the most productive use of a counselor's time and will minimize the disruption of ongoing mathematics instruction.

Group Workshops

Group workshops are an excellent means of dealing with general concerns--e.g., how to present oneself in an interview--and of encouraging constructive group interactions among women. Because counseling in general, and workshops in particular, may initially be strange and intimidating experiences, the first workshop should be seen as no more than a non-threatening warm-up activity for future group work. As the women learn about one another, who they are and why they have come to the program, they will begin the bonding process of the group (see Appendix G, Workshop 1).

There is some latitude with respect to the sequence of the workshops, though it must be noted in the Appendix that Workshop 3 builds on Workshop 2, and Workshop 6 on Workshop 5. Choice of topic and sequence can vary somewhat according to the expressed interests of the group, but some attempt should be made to present workshops on both personal and career-related issues.

Role Models

This component is developed by the administrator and presented in conjunction with the counseling. The role models represent the real world of work; they reinforce the counselor's assessment of available occupations. These models are evidence that women can productively balance home, work, and education in desirable life styles.

There is a growing network of successful career women who value the opportunity to assist other women in career exploration and development. Cooperating women's organizations and agencies, educational institutions, businesses and industries may be sources of women willing to speak to the participants at the class site or at the role model's work site. When possible, the role models should represent the occupational area that the class is studying. A short presentation by the role model should stimulate informal discussion.

Suggested discussion topics for role-model meetings are:

- gaining access to one's career, including experience and educational background, formal and informal career paths, switching careers, and on-the-job training
- looking at life styles, such as long-term planning for work and study; working while one's education is unfinished; and making decisions about career, marriage, and children

- examining male/female interaction in shared work environments, including issues created when women enter "male territory" and images created by language and clothes

Two excellent modes of developing the role model program are cascading the role models and networking. The cascading method is a way of presenting role models from different math-related occupations with different life styles, degrees of education, and ages. At counseling meetings, a role-model session may start with a younger women who discusses balancing her education and career, deciding on marriage and children, and budgeting her time. Another meeting may present an older women who is currently balancing children and career. At yet another meeting, a woman may discuss having a career after raising children. This variety of role models shows how many of the problems now faced by the participants can be solved over time.

Networking is a natural adjunct, bringing the role models together at a separate meeting to share ideas and resources for participants. Role models who are supportive of each other will stimulate new ways of supporting participants in educational facilities and training programs in the working world.

Student Evaluation

Effective instruction and counseling require that some effectively planned and administered student evaluation be done. The participants should know why any testing is being done and how the results will be used. All results should be confidential--information known only to program personnel and individual participants.

Mathematics

Student evaluation of the mathematics component may be informal or formal. Continuous informal evaluation, which usually evokes less anxiety than formal tests, is highly recommended.

Informal

Informal evaluation permits an ongoing assessment of student performance from one-to-one dialogue, classroom participation, and homework. The mathematics instructor can use these data to assess the ability of the student to follow classroom discussions or to complete outside assignments. Individual instruction is useful in determining student errors and thought patterns and in providing immediate feedback to the student. A high level of personal interactions should help to establish trust, thus enabling the student to talk about personal mathematics blocks. Homework assignments can furnish additional evaluation data, so the mathematics instructor should maintain a record of completed assignments.

Formal

It is useful for diagnostic purposes to assess student levels of basic mathematical competencies. The instructor may prepare a test of questions or exercises that will give a measure of students' basic mathematical competencies or may use tests found in textbooks or teacher guides. Newly developed self-assessment tools such as the Torque Tests (Education Development Center) give extensive information, but ample time must be allowed for administration. Alternatively, a standardized test may be obtained from one of the large testing houses (see the tests listed in the Bibliography). An item analysis of these tests can be performed to determine student errors or difficulties; in addition, these tests have scaled scores, including grade-level equivalencies.

Counseling

Formal assessment of the counseling component may be requested by the host institution or agency. In this case, an available measure of self-esteem and/or vocational clarity would be appropriate (see the Bibliography). Although formal assessment is an optional element, some informal measure of participant satisfaction with the utility and enjoyableness of the workshops would be appropriate. A quickly completed questionnaire, rating scale, or open-ended survey administered periodically might provide constructive feedback for the counselor. The nature of the feedback might be appropriate to describe, anonymously, to the group, in order to invite an open sharing of views. More important measures of the utility and relevance of the counseling component are actions taken by the women themselves. A job change effected, a resume written, a college brochure requested, a personal goal acted on are all positive indicators of the helpfulness of the counselor and the attainment of the counseling component.

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Adult Basic Learning Examination, Level III by Bjorn Karlsen, Richard Madden, and Eric F. Gardner; ©1970-71; Adults; The Psychological Corporation.

Designed to determine the general educational level of adults who have not completed formal twelfth-grade education. Level III covers grades 9-12. Subtests are on vocabulary, spelling, reading, and arithmetic (computation and problem solving).

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Assesses the ability to handle computational problems typically encountered in school, home, and community situations.

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A measure of general computational achievement. Designed for use with applicants for entry-level jobs and special training programs whose basic skills are too low to be reliably measured by typical selection tests. The index consists of four levels: addition and subtraction of whole numbers, multiplication and division of whole numbers, basic operations involving fractions, and basic operations involving decimals and percentages.

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Designed to diagnose pupils' specific strengths and weaknesses in working with numbers. The test assesses pupils' understanding of the number system and its properties, facility in computation, and ability to work with numbers in problem-solving and measurement situations.

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This criterion-referenced test covers computation skills (positive whole numbers, positive fractions, positive decimals, positive integers, and other computational processes); concepts and problem-solving (numbers and numeration systems, properties, number theory, set notation and operation, measurement-metric geometry, non-metric geometry, percents, statistics and probability, trigonometry, functions and graphs, ratios, and proportions, math sentences and algebra); and applications (everyday problems and the use of specific concepts).

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Auerbach, Sylvia. A Women's Book of Money: A Guide to Financial Independence. Garden City, New York: Dolphin, 1976. Paperback.

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Pogrebin, Letty Cottin. Getting Yours: How to Make the System Work for the Working Woman. New York: Avon, 1975. Paperback.

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Splaver, Sarah. Nontraditional Careers for Women. New York: Julian Messner, 1975.

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———. 1975 Handbook on Women Workers. Washington, D.C.: U. S. Government Printing Office, 1975.

———. Working Woman's Guide to Her Job Rights. Washington, D.C.: U. S. Government Printing Office, 1976.

Information on Math-Related Careers

AMERICAN ASTRONOMICAL SOCIETY
211 FitzRandolph Road
Princeton, New Jersey 08540

AMERICAN CHEMICAL SOCIETY
1155 16th Street, NW
Washington, D.C. 20036

AMERICAN GEOLOGICAL INSTITUTE
5205 Leesburg Pike
Falls Church, Virginia 22041

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS
1290 Avenue of the Americas
New York, New York 10019

AMERICAN INSTITUTE OF PHYSICS
335 East 45th Street
New York, New York 10017

AMERICAN MATHEMATICAL SOCIETY
P.O. Box 6248
Providence, Rhode Island 02940

AMERICAN METEOROLOGICAL SOCIETY
45 Beacon Street
Boston, Massachussetts 02108

AMERICAN SOCIETY OF AGRONOMY
CROP SCIENCE SOCIETY OF AMERICA
SOIL SCIENCE SOCIETY OF AMERICA
677 South Segoe Road
Madison, Wisconsin 53711

AMERICAN SOCIETY OF CIVIL ENGINEERS
345 East 47th Street
New York, New York 10017

BOTANICAL SOCIETY OF AMERICA
New York Botanical Gardens
Bronx, New York 10458

COMMITTEE OF PRESIDENTS OF STATISTICAL SOCIETIES
c/o AMERICAN STATISTICAL ASSOCIATION
806 15th Street, NW
Washington, D.C. 20005

ELECTRONIC INDUSTRIES ASSOCIATION
2001 Eye Street
Washington, D.C. 20006

ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT
345 East 47th Street
New York, New York 10017

ENTOMOLOGICAL SOCIETY OF AMERICA
4603 Calvert Road
P.O. Box AJ
College Park, Maryland 20740

GUIDE TO FEDERAL CAREER LITERATURE
U.S. Civil Service Commission
Washington, D.C.

INSTITUTE OF FOOD TECHNOLOGISTS
Suite 2120
221 North LaSalle Street
Chicago, Illinois 60601

INSURANCE INFORMATION INSTITUTE
110 William Street
New York, New York 10038

INTERNATIONAL OCEANOGRAPHIC FOUNDATION
3979 Rickenbacker Causeway
Virginia Key
Miami, Florida 33149
(Brochure: "Training and Careers in Marine Science")

MANUFACTURING CHEMISTS ASSOCIATION
1825 Connecticut Avenue, NW
Washington, D.C. 20009

MATHEMATICAL ASSOCIATION OF AMERICA
1225 Connecticut Avenue, NW
Washington, D.C. 20036

THE METALLURGICAL SOCIETY OF AIME
345 East 47th Street
New York, New York 10017

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS
1609 Association Drive
Reston, Virginia 27091

NATIONAL SCIENCE TEACHERS ASSOCIATION
1201 16th Street, NW
Washington, D.C. 20036

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
2029 K Street, NW
Washington, D.C. 20036

SCIENCE AND ENGINEERING CAREERS: A Bibliography (seventh edition)
Scientific Manpower Commission
1776 Massachusetts Avenue, NW
Washington, D.C. 20036

Selected Sources of Financial Aid (Books)

American Chemical Society. Financial Aid for College Students: Sources of Information. 1155 16th Street, NW, Washington, D.C. 20036.

AAUW Sales Office. Educational Financial Aids. 2401 Virginia Avenue, NW, Washington, D.C. 20037.

Bureau of Higher Education, U.S. Office of Education. Information for Students. Washington, D.C.

———. Student Aid Annual. Moravia, New York: Chronicle Guidance Publishers, Inc.

ECPD. Need Financial Aid for College? 345 E. 47th Street, New York, New York.

General Motors Corporation, Public Relations Staff. General Motors Educational Opportunities. Detroit, Michigan.

Johnson, Willis (Ed.). Directory of Special Programs for Minority Group Members. Garret Part, Maryland: Garret Park Press. (Has special section on women.)

NEA, Research Division. Sources of Information on Student Aid. 1201 16th Street, NW, Washington, D.C.

National League for Nursing. Scholarships and Loans: Beginning Education in Nursing, 1972. 10 Columbus Circle, New York, New York.

National League for Nursing. Scholarships, Fellowships, Educational Grants and Loans for Registered Nurses, 1973. 10 Columbus Circle, New York, New York.

U.S. Department of Health, Education, and Welfare, National Institute of Health, Division of Physicians and Health Professions Education. Health Professions Scholarship Program, 1972. Bethesda, Maryland.

U.S. Department of Health, Education, and Welfare, Public Health Service, Health Resources Administration, Bureau of Health Resources Development. How Health Professions Students Finance Their Education, 1972. Washington, D.C.

———. How to Get Money for College. Washington, D.C.: U.S. Government Printing Office. (FS5.155:55050.)

Selected Sources of Financial Aid (Scholarships and Awards)

BERTHA LAMME-WESTINGHOUSE SCHOLARSHIPS
Supported by a grant from Westinghouse Education Foundation in memory of the first woman engineer employed by Westinghouse. It is for entering freshmen women to attract them to the field of engineering.

CERTIFICATE OF ACHIEVEMENT

Administered locally to recognize girls who have demonstrated special achievement in technical and scientific studies or projects.

GENERAL ELECTRIC FOUNDATION SCHOLARSHIPS

For outstanding women students who will be incoming freshmen in an Engineering Council for Professional Development accredited school. Continued for four years if the students maintain good scholastic averages.

SOCIETY'S CERTIFICATE OF MERIT

Administered by Sections and Members-at-Large in their localities to honor high school girls who have demonstrated three years of excellence in mathematics and science.

TRW SCHOLARSHIPS

Supported by the TRW Foundation for freshmen women majoring in engineering.

PART III: APPENDICES

APPENDIX A Recruiting Admission Form

BOSTON COMMUNITY SCHOOLS

Room 716
City Hall Plaza
Boston, MA 02201

KEVIN H. WHITE, *Mayor*

Paul Grogan, Director

SAMPLE

APPLICATION

MATH CAREERS PROGRAM FOR WOMEN
Boston Community Schools/Boston University School of Education

This program will give participants basic math training team-taught by a math instructor and a counselor who will assist application of the math to occupational use and exploration of new career goals.

Please Print

NAME ____________________ DATE __________

ADDRESS ____________________ PHONE __________

CHECK ONE: Community school nearest your home

AGASSIZ ____ CONDON ____ HOLLAND ____ JACKSON/MANN ____ QUINCY ____

CHECK ONE: I have a High School Diploma ____ School __________ Year ____
I have a GED (General Equivalency Diploma) __________ Year ____
Additional Education ____________________

I studied math in high school. Yes ____ No ____
List high school math courses, if any: ____________________

Do you have a paid job now? Yes ____ No ____
If yes, list tasks: ____________________

What is your reason for taking this course? Number in order of importance. (Do not include reasons which do not apply to you.)
____ To prepare me for an educational or job-training program with mathematics requirements. ____ To prepare me for another job. ____ To help me enter the world of work. ____ Other--What? ____________________

____

CHECK: My Math Skills	Satisfactory	Needs Work
Whole numbers:		
addition/subtraction	____	____
multiplication/division	____	____
Fractions/decimals:		
addition/subtraction	____	____
multiplication/division	____	____
Percentages/ratios:	____	____
Metrics:	____	____
Hand calculator:	____	____
Word problems:	____	____
Algebraic equations:	____	____

APPENDIX B Class List Form

Instructor ______________________

Telephone ______________________

Counselor ______________________

Telephone ______________________

Participant's Name	Telephone	Hours to Telephone

APPENDIX C
Sixteen Week Lesson Plan Model

Week 1*

Session 1

Goals

- To provide an overview of the program in terms of the participants' roles, goals of the program, materials, outcomes, and personnel
- To determine the entry-level, basic mathematics skills of the participants

Activities

1. Math instructor and counselor: Present "orientation" information.
2. Administer formal testing. (See the "Evaluation" section.)

Resources

See the Bibliography for a list of basic math tests (note: The Business of Mathematics by Willerding is the text used throughout these Lesson Plans).

* *

Session 2

Goals

- To familiarize participants with the text
- To emphasize "number-sense" skills in computation

Activities

1. Hand out the texts and go over its distinctive features: topics, exercises for calculators, answer key (odd-numbered exercises), etc.
2. Lead a group discussion and begin the problem-solving of number patterns (pp. 2-5) and multiplication by powers of ten (pp. 16-18).
3. Divide the class into two groups:
    a. Those who work with the instructor on oral problem-solving of squaring a number whose numeral ends in 5 (pp. 20-22) and review of step 2 above.
    b. Those who do seat work in exercise 1.1 (pp. 5-8).
4. Rotate small groups (steps 2 and b above).
5. Have the whole group complete Chapter 1 review (pp. 24-27), odd-numbered exercises.

Resources

Willerding, Chapter 1.

Homework

Complete even-numbered exercises in Chapter 1 review.

---

*Note: The instructor should feel free to revise and add to the Lesson Plans provided, depending on the experience and needs of the program participants.

Week 2

Session 1

Goals

- To provide feedback regarding test performance (week 1, session 1)
- To provide positive reinforcement for completion of homework
- To familiarize participants with the problem-solving process

Activities

1. Return the test answer sheets. Review a few examples at the board. (Stress the diagnostic use of the test.)
2. Review homework answers, choosing random exercises, at the students' request, to solve at the board.
3. Lead a problem-solving session with warm-up exercises (pp. 7-15).
4. Synthesize the problem-solving session with a list of skills practiced.

Resources

Greenes et al., Chapter 2

Evaluation

Successful completion of six out of ten homework examples

* *

Session 2

Goals

- To review the basic rules of four math operations with whole numbers
- To provide practice with four operations

Activities

1. Review the rules for adding, subtracting, multiplying, and dividing whole numbers.
2. Hand out copies of addition-subtraction or multiplication-division puzzles to class members based on their self-assessed needs.
3. Ask group members to work cooperatively in pairs on the same puzzle.

Resources

Hestwood et al., addition-subtraction, p. 21; multiplication-division, p. 43, cross-number puzzles

Evaluation

Successful completion of a cross-number puzzle by learners in pairs

---

Counseling Workshop 1: "Warming Up a Group" (Appendix G)

Week 3

Session 1

Goals

- To provide further practice with the problem-solving process
- To explore fractions in the context of their everyday use and in four math operations

Activities

1. Review the problem-solving skills introduced (week 2, session 1) and continue oral problem solving of easy warm-up exercises (pp. 7-15).
2. Discuss the daily use of fractions, using newspaper sections to illustrate.
3. Review the basic rules of fractions in four operations, using the text as the organizer of presentation.
4. Assign seat work from the text and work with students on a one-to-one basis.

Resources

Willerding, Chapter 2

Homework

Complete Chapter 2 review, pp. 68-70

* *

Session 2

Goals

- To reinforce comprehension of the use of fractions in computation
- To demonstrate the use of math in a work context through an occupational module

Activities

1. Check homework completion. Solve student-selected exercises at the board, stressing methods.
2. Hand out a copy of the "Accountant" module to each student, giving a brief introduction regarding the purpose of modules in the course.
3. Have the students complete the tasks in the module on their own. Go over the answers with those who complete the module.

Resources

Module 1: "Accountant" (Appendix F)

Homework

Complete the module

Week 4

Session 1

Goals

- To encourage peer assistance in the completion of tasks
- To explore decimals in the context of their everyday use and in four math operations

Activities

1. Ask the class members who corrected their module during the last session (week 3, session 2) to go over their answers with those class members who completed the module for homework.
2. Discuss the daily use of decimals, using newspaper sections to illustrate.
3. Review the concept of place value.
4. Review the basic rules of decimals in four operations, using the text as the organizer of presentation.
5. Assign seat work from the text and work with students on a one-to-one basis.

Resources

Willerding, Chapter 3

* *

Session 2

Goals

- To reinforce the concept of place value and the use of decimals in four math operations
- To practice rounding decimals

Activities

1. Divide the class into two groups:
    a. Those who work with the instructor on the oral solution of chapter review exercises 1-10 (pp. 100-102).
    b. Those who work at their seats on exercises 11-20 (pp. 102-103).
2. Rotate the groups (a and b above).

Resources

Willerding, Chapter 3

Homework

Complete the rounding exercises 1-20, pp. 79-80

Counseling Workshop 2: "Values Clarification in the Decision-Making Process" (Appendix G)

Week 5

Session 1

Goals

- To establish the value of estimating skills in math-related problems
- To increase the student's confidence in her ability to make an accurate estimate

Activities

1. Review homework, with volunteers supplying the correct answers.
2. Discuss the distinction between estimating and guessing.
3. Demonstrate four approaches to accurate estimating (discuss homework under "rounding"); encourage oral participation in estimating by four approaches
4. Have the group complete exercises 1-11 of Appendix E, "Estimating Skills Unit."
5. Reconvene the whole group to discuss their answers. Have volunteers present their own estimating problems for others to solve.

Resources

"Estimating Skills Unit" (Appendix E); Locke, Workbook, pp. 11-12 (optional); Willerding, Chapter 3, pp. 79-80 (homework due)

* *

Session 2

Goals

- To introduce the use of hand-held calculators as business tools
- To apply estimating skills to the use of hand-held calculators

Activities

1. Discuss the widespread use of calculators and computers in business (distinguishing between them) and human skills involved in their use.
2. Demonstrate hand-held calculator capabilities and rules for use (e.g., battery charging, symbols on keys).
3. If all participants are using the same model, design a worksheet to introduce its capabilities.
4. Hand out the "Estimating Skills with Calculators" worksheet (Appendix E) and have students complete it on their own.
5. Discuss the answers orally, including students' self-designed examples ("F").
6. Assign calculator exercises for homework, and provide one-to-one assistance (pp. 103-107).

Resources

A hand-held calculator (optional: teacher-designed worksheet); worksheet, "Estimating Skills with Calculators" (in Appendix E under "Information for Instructors"); Willerding, Chapter 3

Week 6

Session 1

Goals

- To review homework as an assessment of competencies relating to the use of a hand-held calculator
- To organize problem-solving strategies through the use of checklists

Activities

1. Have individual participants offer answers for homework. Permit ample time for questions related to the use of a calculator.
2. Use (Greenes') problem-solving checklist to solve the first two problems in Chapter 4, pp. 21-26.
3. Synthesize the problem-solving session through review of the checklist.

Resources

Willerding, Chapter 3; Greenes et al., Chapter 3 (checklist explained for instructors); Greenes et al., Chapter 4

Evaluation

Completion of homework with 80% accuracy

Homework

Fourth problem, Greenes et al., Chapter 4, pp. 30-32

* *

Session 2

Goals

- To reinforce the use of the problem-solving checklist through review of homework
- To introduce the concept of ratio

Activities

1. Reproduce the problem-solving checklist by having class members recall the steps from memory.
2. Solve homework problems using class members' work as a guideline.
3. Discuss ratio in popular and job-related contexts.
4. Have students complete odd-numbered exercises 1-15 (pp. 129-130) on ratio. Work on a one-to-one basis with students while they do seat work.

Resources

Greenes et al., Chapter 4; Willerding, Chapter 5

Counseling Workshop 3: "Decision Making" (Appendix G)

Week 7

Session 1

Goals

- To introduce the concepts of proportion, percent, and business fractions
- To provide practice with hand-held calculators in the completion of exercises pertaining to the above concepts

Activities

1. Discuss proportion in popular and job-related contexts.
2. Have students complete odd-numbered exercises (pp. 133-134) at their seats; provide individual assistance.
3. Repeat steps 1 and 2 above with percent (pp.138-140) and business fractions (p. 141).
4. In pairs, have class members work on the calculator exercises on these concepts (pp. 150-153), providing assistance to each other.

Resources

Willerding, Chapter 5

* *

Session 2

Goal

- To reinforce an understanding of fractions, decimals, and percent through games and puzzles

Activities

1. Set up work stations to accommodate groups of 4-6 in games or puzzle activities (provide game rules or answer key as appropriate at each station).
2. Divide the class into groups of 4-6; these intact groups will move together from station to station.

    Stations
    a. Three card games: decimals
    b. Two card games: fractions, decimals, percent, match
    c. Puzzle: percent, ratio, decimals
    Note: time the groups' stay at each station.

Resources

Card games--Rucker & Dilley, pp. 64-65, 72-74; puzzle--Swienciki, Percent, pp. 42-43.

Week 8

Session 1

Goals

- To provide further practice with problem-solving techniques
- To explore the calculation of wages and salaries and of typical deductions

Activities

1. Conduct an oral problem-solving session, using warm-up exercises (pp. 57-58; 61-63).
2. Introduce compensation terminology (e.g., wage, salary, commission) and describe the differences, using the text as organizer of the presentation.
3. Emphasize the calculation of salary deductions (because of the chart reading involved) and provide seat work on same.

Resources

Greenes et al., Chapter 5, pp. 57-58, 61-63; Willerding, Chapter 6

Homework

Assign problems from chapter review, pp. 198-201

* *

Session 2

Goal

- To demonstrate the use of math in a work context through an occupational module

Activities

1. Review homework answers, using volunteers to supply the correct information.
2. Hand out a copy of the "Bookkeeper" module to each student to complete during class time.

Resources

Willerding, Chapter 6; Module 2: "Bookkeeper" (Appendix F)

Counseling Workshop 4: "Launching an Effective Job Hunt" (Appendix G)

Week 9

Session 1

Goals

- To preview the second half of the course
- To explore four types of insurance in terms of how to calculate the premiums

Activities

1. Math instructor and counselor: Describe upcoming math and workshop topics and visits by role models.
2. Discuss insurance from a consumer's perspective.
3. Divide the class into four groups. Assign each group a type of insurance to read about in the text and do seat work on.
4. Work with one group while the other groups, on their own, rotate to the other three groups in turn.
5. Next have the groups work together to produce:
    a. a concise definition and illustrations of the type of insurance studied
    b. a brief description of how one calculates a premium

   These will be shared orally in the next session.

Resources

Willerding, Chapter 8

* *

Session 2

Goals

- To reinforce student understanding of how math is used to calculate premiums for four types of insurance
- To practice insurance-related calculations with hand-held calculators

Activities

1. In turn, ask a spokesperson from each of the four groups to explain the type of insurance studied, using guidelines (Session 1, step 4).
2. Have the students complete an exercise for each of four types of insurance from the chapter review (pp. 261-264).
3. Have the students complete random problems for calculators (pp. 264-267).

Resources

Willerding, Chapter 8

Week 10

Session 1

Goal

- To explore the calculation of banking related to mathematics, including interest and bank notes

Activities

1. Discuss the class members' experience with banks from a consumer's perspective, asking members to volunteer banking terms with which they are familiar.
2. Present formulas for simple interest, promissory note and present value.
3. Assign students to one of three groups (according to the headings in step 2) and have the groups complete exercises from the text on their topic (pp. 274-275; 285-286; 290-291). Work with one of these groups.
4. Rotate students among groups so that all students complete exercises on the three topics.

Resources

Willerding, Chapter 9

Homework

Ask each class member to check at her bank regarding regulations governing checking accounts (e.g., cost of checks, minimum balance) and savings accounts (e.g., interval of compound interest)

* *

Session 2

Goal

- To explore the mathematics of checking and savings accounts

Activities

1. Discuss the findings of class members with respect to their investigations of banking regulations (homework), noting the variations from bank to bank. Discuss the implications for the consumer.
2. Have the class practice making checking-account deposits, with slips and checks supplied by a local bank.
3. Discuss reconciliation of account. Assign exercises as seat work, and work on a one-to-one basis with students (pp. 302-303).
4. Discuss compound interest with the class and practice the use of a compound interest table with the whole class (pp. 308-310).

Resources

Willerding, Chapter 9

Homework

Assign even-numbered problems for calculators, pp. 320-322

Counseling Workshop 5: "Women and Men in the World of Work--Assertiveness in the Work Context" (Appendix G)

Week 11

Session 1

Goals

- To provide further practice with problem-solving techniques
- To reinforce students' understanding of banking practices through a review of the homework
- To explore the presentation of data by means of graphs

Activities

1. Conduct an oral problem-solving session, using warm-up exercises (pp. 64-66).
2. Review homework, asking volunteers to provide the correct answers. (Verify with the teacher's answer key.)
3. Discuss bar, line, and circle graphs, using the text as organizer of the presentation.
4. Hand out graph paper and have the students practice graph construction by completing exercises 6-9, chapter review, pp. 522-524.

Resources

Greenes et al., Chapter 5, pp. 64-66; Willerding, pp. 198-201 (homework); Willerding, Chapter 16, pp. 500-517, 522-524; graph paper

Evaluation

Completion of homework with 80% accuracy

* *

Session 2

Goal

- To demonstrate the use of math in a work context through an occupational module

Activities

1. Hand out a copy of the "Bank Teller" module (Appendix F) to the class for completion as seat work.
2. Go over the answers with those who have completed the module.

Resources

Module 3: "Bank Teller" (Appendix F); graph paper

Week 12

Session 1

Goal

- To explore the mathematics of basic statistics: mean, median, and mode

Activities

1. Show the film Statistics at a Glance as an introduction to statistics, and reinforce the idea that statistics are used and reported daily.
2. Present the concept of "mean" and its applications.
3. Assign exercises relating to the calculation of mean (pp.494-500) and work on a one-to-one basis with students.
4. Repeat steps 2 and 3 above with the concepts of "median" and "mode."
5. Reconvene the class as a whole to review these concepts.

Resources

Statistics at a Glance (John Wiley & Sons); Greenes et al., Chapter 16, pp. 487-500.

Homework

Greenes et al., problems for calculators, pp. 524-525.

* *

Session 2

Goals

- To reinforce understanding of the basic statistical terms "mean," "median," and "mode," through review of the homework
- To practice the use of statistics and their presentation in graph formats

Activities

1. Review homework, asking volunteers to supply the correct answers. Demonstrate the solution of calculator problems which caused difficulty.
2. Divide the class into four small groups and supply each group with a statistics/graph puzzle page.
3. Have the groups cooperate in the solution of their pages. (Supply an answer sheet to each group before they rotate.)
4. Have the groups rotate to three other stations so that all students have completed four puzzles.

Resources

Marcy and Marcy, Pre-Algebra with Pizzaz, pp. 61-64

Evaluation

Completion of homework with 80% accuracy

Counseling Workshop 6: "Communication Skills in Interviews" (Appendix G)

Week 13

Session 1

Goal

- To demonstrate the use of math in a work context through an occupational module

Activities

1. Set up the coil-spring apparatus as described in the "Engineering Technician" module, and demonstrate its use to the class. Refer the students to references to this apparatus in their module.
2. Have students complete the module as seat work, using their calculators as appropriate.
3. Discuss the answers, with particular emphasis on the last task of the module (i.e., memo to boss), as a test of their understanding of the process.

Resources

Module 4: "Engineering Technician" (Appendix F)

* *

Session 2

Goals

- To introduce the metric system as a universal mathematical language
- To practice basic metric terminology
- To explore the metric units of meter, gram, liter, and degree through hands-on experiments with measurement

Activities

1. Discuss worldwide use of the metric system; use an atlas to stress global use of the metric system. Stress the system's advantages.
2. Discuss the metric system as a language; present four metric units and their prefixes. Have the students complete an exercise on terminology (pp. 530-532).
3. Orient the students to four work stations, explaining metric equipment, worksheets, and the location of answer sheets.
4. Divide the class into four groups (meter, gram, liter, and degree) and rotate the groups through all stations (have the students work in pairs).
5. Reconvene the class to discuss their activities.

Resources

Teacher-designed worksheets, based on room facilities and the metric equipment available

Week 14

Session 1

Goals

- To organize the review needs of class members for exploration next week
- To provide practice for problem-solving techniques
- To demonstrate the use of metric measurement in a work context through an occupational module

Activities

1. Ask class members to write on a piece of paper a description of two math concepts, operations, topics, etc., with which they are having difficulty, and to write their names (so they can be grouped according to interests).
2. Review the problem-solving checklist with the class, and conduct an oral problem-solving session on problems (pp. 69, 75, 77).
3. Hand out copies of the "Pharmacy Assistant" module to the class for completion as seat work.

Resources

Greenes et al., pp. 69, 75, 77; Module 5: "Pharmacy Assistant" (Appendix F)

Homework

Completion of the module

* *

Session 2

Goals

- To reinforce understanding of metric language through review of homework
- To further examine the extent of use of the metric system in the United States

Activities

1. Discuss the answers to the tasks in the module; emphasize the work-related issues.
2. Hand out sections of newspapers and journals (include technical journals).
3. Have students work in pairs to examine these documents for references to the metric system and report orally on their findings.
4. Discuss with the class the difficulties of educating a large population in the use of a new measuring system. Brainstorm strategies.

Resources

Newspapers and journals

Counseling Workshop 7: "Obstacles to Achievement" (Appendix G)

Week 15

Session 1

Goal

- To provide a review for the class, based on the needs expressed during the previous week

Activities

1. Group students based on the first math need expressed in the previous week.
2. Work with one group, while assigning review exercises to the other groups. Encourage peer tutoring in groups to eliminate basic problems.
3. Rotate to the other groups on a timed basis, requesting feedback from tutoring to assess the precise nature of the problems faced.

Resources

Text, class notes, worksheets from the course, modules, etc.

Note: Provide an opportunity for the class members to reassess their second need (as expressed the previous week) before finalizing the groups for the next session.

* *

Session 2

Goal

- To provide a review for the class, based on the needs expressed during the previous session

Activities

1. Group students based on the second math need expressed in the previous session.
2. Work with one group, while assigning review exercises to the other groups. Encourage peer tutoring in the groups to eliminate basic problems.
3. Rotate to the other groups on a timed basis, requesting feedback from tutoring to assess the precise nature of the problems faced.

Resources

Text, class notes, worksheets from the course, modules, etc.

Week 16

Session 1

Goal

- To determine the level of basic mathematics skills at the termination of the program

Activity

Administer formal testing. (See the "Evaluation" section.)

Resources

See the Bibliography for a selected list of basic math tests

* *

Session 2

Goals

- To provide feedback regarding test performances
- To look at test performance in the context of basic statistics
- To assess the course informally

Activities

1. Return the tests and discuss the general class profile.
2. Show how the results can be reported in terms of mean, median, and mode. Discuss the pre- and post-test model of evaluation.
3. Discuss participants' reactions to the program, perhaps by using the methods suggested under "Student Evaluation--Counseling."
4. Collect any materials belonging to the program.

Counseling Workshop 8: "Providing Closure" (Appendix G)

APPENDIX D

Mathematics Requirements for Three Occupational Clusters

1. Business and Office

MATH SKILLS		OCCUPATIONS				
		Bookkeeping	Billing Machine Operator	Statistical Secretary	Accountant	Stenographer
ARITHMETIC	Four fundamental operations, whole numbers, fractions	X	X	X	X	X
	Percentages/ratios	X	X	X	X	X
	Approximations	X	X	X	X	X
	Measurement--metrics	X	X	X	X	X
MATH MACHINE	Hand calculator	X	X	X	X	X
	Desk calculator	X	X	X	X	
ALGEBRA	Signed numbers	X	X	X	X	
	Formulas	X			X	
	Solution of equations				X	
	Linear equations				X	
STATISTICS	Graphs	X	X	X	X	X
	Central tendencies				X	
	Deviations				X	
	Tables	X	X	X	X	X
	Tests of hypotheses					

2. Marketing and Distribution

MATH SKILLS		OCCUPATIONS				
		Field Interviewer	Advertising Assistant	Assistant Store Manager	Assistant Buyer	Bank Teller
ARITHMETIC	Four fundamental operations, whole numbers, fractions	X	X	X	X	X
	Percentages/ratios	X	X	X	X	X
	Approximations	X	X	X		
	Measurement--metrics	X	X	X	X	
MATH MACHINE	Hand calculator	X	X	X	X	X
	Desk calculator			X		X
ALGEBRA	Signed numbers	X		X		X
	Formulas		X			
	Solution of equations					
	Linear equations					
STATISTICS	Graphs	X	X	X		X
	Central tendencies		X			
	Deviations		X			
	Tables	X	X	X		X
	Tests of hypotheses		X			

3. Technical

MATH SKILLS		OCCUPATIONS				
		Clin. Lab Assistant	Pharmacy Assistant	Electronics Assistant	Engin./Science Equip. Tech.	Food Processing Technician
ARITHMETIC	Four fundamental operations, whole numbers, fractions	X	X	X	X	X
	Percentages/ratios	X	X	X	X	X
	Approximations	X	X	X	X	X
	Measurement--metrics	X	X	X	X	X
MATH MACHINES	Hand calculator	X	X	X	X	X
	Desk calculator		X			
	Meter			X	X	
ALGEBRA	Signed numbers	X		X	X	X
	Formulas	X	X	X	X	X
	Solution of equations			X	X	
	Linear equations			X		
STATISTICS	Graphs	X	X	X	X	X
	Central tendencies	X		X	X	X
	Deviations			X	X	X
	Tables	X	X	X	X	X
	Tests of hypotheses					

APPENDIX E
Estimating Skills Unit

Every day someone "estimates" an answer or solution to a commonplace problem, such as

- How many miles to the gallon does my car average if the gas attendant fills the tank with 10.9 gallons and the car odometer shows 188 miles?
- With only $20.00 in my wallet, can I afford items costing $12.97, $3.21, $1.53, $2.17, and $1.03?

At work, one encounters situations which call for accurate "estimates," such as

- Do the subcontractors' bids of $21,674.00, $97,305.00, and $72,899.00 total close to or over the $200,000.00 budgeted for building renovations?
- Is the accountant's figure of $55,238.00 accurately derived from $4,791.00, $15,605.00, $78,912.00, $14,695.00, and $11,235.00?

Definition

"Estimates" are educated guesses, used in context where approximate values rather than exact values are appropriate to report.

Exact values are needed in the following situations:

- filling out an income tax form
- informing someone regarding the departure of a plane
- balancing a corporate budget

Approximate values (estimates) can be reported in the following situations:

- reporting the average income for a group of people
- planning a vacation budget based on average daily costs
- reporting on the audience turnout at a widely publicized concert

In this unit are a variety of exercises to strengthen your ability to make accurate estimations. Circle the appropriate answer.

1. Which alternative will produce the more accurate estimate?

   a. 90 x 740 = ______________

   Rounding: 100 x 700 or 100 x 800

   b. $\begin{array}{r} 674 \\ +449 \\ \hline \end{array}$

   Rounding: $\begin{array}{r} 700 \\ +400 \\ \hline \end{array}$ or $\begin{array}{r} 700 \\ +500 \\ \hline \end{array}$

2. Which is the more accurate estimate?

   a. 818 x 9 = ______________

      Answer: 8,000? or 9,000?

   b. 7,420
      -5,964

      Answer: 1,000? or 2,000?

3. If a blazer costs $39.95, a wool skirt $42.49, a blouse $16.95, and shoes $24.97, will Sheila exceed her credit-card limit of $150.00?

   Answer: Yes_____ No_____

4. Jean's son babysits for neighbors at a rate of $1.00 an hour. He averages 15 hours per week. Based on a summer of 12 weeks, he expects to earn about $400.00 before he returns to school.

   Is his estimate reasonable?

   Answer: Yes_____ No_____

5. Bonnie bought a motorcycle costing $798.00 by putting a $200.00 deposit down and agreeing to pay off the balance in two years. She expects the monthly charge to be $50.00 per month.

   Is her estimate reasonable?

   Answer: Yes_____ No_____

6. 9,000 + 7,000 = 16,000

   Which are greater than 16,000? Less? Circle the math symbols > (greater) or < (less) to indicate your answer.

   a. 9,019 + 7,213 =, > or <
   b. 8,997 + 6,847 =, > or <
   c. 9,000 + 7,638 =, > or <
   d. 8,724 + 7,000 =, > or <

7. Martha is a real-estate agent who has just sold a commercial property for $750,000.00. Her commission rate is 4%.

   Will she earn $300.00; $3,000.00; or $30,000.00?

   Answer: ______________

8. Arlene is learning how to use a calculator. She enters 40.52 and multiplies it by 91. It displays 3,687.32.

   Is this correct or should the answer be 368.732 or 36,873.2?

   Answer: ____________

9. Estimate the sum of $914,681.00 and $43,725.

   By rounding to the nearest hundred thousand: $____________
   By rounding to the nearest ten thousand: $____________
   By rounding to the nearest hundred: $____________

   Which of the above estimates is the closest to the true value? Why?

   ____

   ____

10. Show the possible range of answers for the following examples.

    (smallest) (largest)
    1,642 ± 100 = ____________ to ____________
    300 ± 25 = ____________ to ____________
    5 ± 5 = ____________ to ____________
    800 ± 30 = ____________ to ____________

11. Think of a situation related to your job which requires you to estimate a value. Turn this situation into a word problem like the ones you have just completed. (Other class members will estimate the right answer after you describe the problem orally or at the board.)

    ____

    ____

    ____

    ____

    ____

ESTIMATING SKILLS UNIT

Information for Instructors

Prerequisite skills for accurate estimation include an understanding of

- order relations
- number patterns (especially 10; 100; 1,000; etc.)
- place value (including placement of a decimal point)

Consequently, this unit should be introduced after a review of these mathematical concepts. The text addresses number patterns (Chapter 1) and place value (Chapter 3) in detail with appropriate exercises.

It has been noted that while "estimation is more important than precise calculation for many common uses of mathematics, [nevertheless it is] one of the most neglected skills in the curriculum" (Carpenter, p. 296). Attention to estimation in this curriculum is advised because of its practical application to work contexts and the confidence it can engender from an understanding that mathematics does not always involve "right/wrong" choices. This is an area of mathematics which values intuition, and trial and error--a novel idea to students whose stereotypes of mathematics are based on its purported rigidity.

Activities for the Unit

1. Discuss the terms "estimation" (the act of estimating) and "estimate" (the product of estimating). Clarify that while an estimate is a kind of guess (versus calculation of an exact value), it is not a wild guess. There are specific ways to become accurate in one's method of obtaining an approximate value.

2. Introduce the four approaches to estimation which are detailed by Paul R. Trafton in "Estimation and Mental Arithmetic: Important Components of Computation," National Council of Teachers of Mathematics Yearbook, 1978, pp. 196-213.

   Briefly, these four approaches are:

   a. computing with rounded numbers (also covered by the text, pp. 77-80)
      Note: Stress that the situation in which the estimate is to be used will influence the degree of precision necessary
   b. using a reference point
      Note: This is particularly useful in contexts using money (e.g., can you buy both a $2.13 and a $.79 item for $3.00?)
   c. "front-end" estimation (i.e., attention to leftmost digits)
      Note: This approach is useful in addition and subtraction problems with numbers of three or more digits
   d. estimating the range of an answer
      Note: This checks the "reasonableness" of an answer

3. Have the class complete ten exercises on their worksheet, and encourage creation of an estimation word problem.

   If students are having difficulty creating a word problem, work with them on a one-to-one basis. If several or all students create a word problem, it would be useful to collect their examples and write them out for a future worksheet.
   Note: Further word problems can be found in Locke, College Mathematics for Business: A Workbook, pp. 11-12.

4. Ask class volunteers to read aloud, or put on the board, their word problems for others to solve.

Where possible, integrate estimating problems or exercises into the regular curriculum. Because estimation is a useful way of checking for human error in the use of calculators, a worksheet is attached here for use after the introduction of calculators. (See the Lesson Plans, Week 5, in Appendix C.) Other places in the curriculum which would profit from the integration of estimation include those lessons dealing with money (e.g., the text's Chapter 6, "Wages and Salaries") and with metrics (Chapter 17, "The Metric System").

WORKSHEET

Estimating Skills and the Calculator

1. When using a hand-held calculator, it is easy to punch the wrong key, misplace the decimal point, or accidentally clear the operation.

   The following operations were entered in a calculator and answers displayed. Estimate whether these answers are reasonable.

   Reasonable
   a. 378 + 594 = 672 Yes_____ No_____
   b. 179 + 342 = 521 Yes_____ No_____
   c. 9,178 - 3,904 = 5,274 Yes_____ No_____
   d. 189 ÷ 20 = 94.5 Yes_____ No_____

---

2. Estimate a reasonable answer for each of the following examples and then use your calculator to verify that your estimate is reasonable.

   a. 9,432
   6,751
   3,223
   8,518
   Estimate______________
   Precise Value ________________

   b. $74,609.12
   -16,458.77
   Estimate ______________
   Precise Value ________________

   c. 4,621
   x319
   Estimate______________
   Precise Value________________

---

3. Show your rounding process in the blank column labeled "rounding," then use your calculator to provide the "precise value."

EXAMPLE	ROUNDING	ROUNDING RESULT	PRECISE VALUE
a. 42 x 42		1,600	
b. 819 ÷ 4		200	
c. 22 x 22		400	
d. 888 ÷ 3		300	
e. 421 ÷ 18		20	
f.			

---

4. Think of an example to put in "f" above.

APPENDIX F
Occupational Mathematics Modules With Information for Instructors

Module 1

Accountant

Ann Cheung is an accountant in a Boston textile firm, Sun Textiles. A typical day for her includes firsthand work on the accounts of her firm, supervision of two bookkeepers who work for her, and meetings with other departments such as sales and marketing.

If you were in Ann's position, you would have final responsibility for the accuracy of the following:

a. the gross income of the firm
b. the total expenses of the firm
c. the net income of the firm
d. the total assets of the firm
e. the total liabilities of the firm

Ann also computes such figures when handling her personal money. You may wish to practice these operations to balance your own budget. (See the practice sheet on page 84.)

* *

Gross Income

> Gross income is the total amount of money received by a company during a given period of time (e.g., week, month, year) before expenses are deducted.

On the next page is a monthly statement of the gross income from the three product departments of Sun Textiles Company. Look at the computer printout sheet, like one Ann receives every month, and complete the questions which follow.

Gross Income (Monthly) by Department

Week	Department	Amount
01	001	$17,651.00
01	002	9,712.00
01	003	(2,100.00)
02	001	15,011.00
02	002	7,433.00
02	003	1,916.00
03	001	16,848.00
03	002	6,952.00
03	003	(502.00)
04	001	16,246.00
04	002	8,999.00
04	003	2,087.00

Computer Printout Code

Column: "Week" - 01 = first week; 02 = second week, etc.
"Department" - 001 = Imported Fabrics
002 = Domestic Fabrics
003 = Notions

Task I

In the spaces provided, transfer the correct amounts from the computer printout above, and calculate the gross income of the Sun Textile Company for the month.

Sun Textile Company
For the Month Ending ____________________

Week	Imports	Domestic	Notions
01	____________	____________	____________
02	____________	____________	____________
03	____________	____________	____________
04	____________	____________	____________
Total for the Month	$____________	$____________	$____________

Total Gross Income for the Month $____________________

The total gross income for the month is representative of the average gross income per month in the current fiscal year of the Sun Textile Company.

Estimate the expected gross annual income for the company, based on this month's gross income. $ ______________

* *

Total Expenses

Total expenses are the sum of all monies paid out by a company during a given period of time (e.g., week, month, year).

Jeanette, a bookkeeper who works for Ann, prepares monthly figures for the entries below. She will report the figures to be entered beside the headings provided at the left so that Ann knows the total expenses for the same month for which gross income was calculated in Task I.

Task II

The bookkeeper will tell you these figures orally for you to enter in the spaces provided. Calculate the total expenses for the month.

Sun Textile Company
Total Expenses (Monthly)
For the Month Ending ______________

Telephone	______
Light & Heat	______
Insurance	______
Car Expenses (Sales Reps.)	______
Taxes	______
Depreciation	______
Salaries	______
Supplies & Stationery	______
Rent	______
Petty Cash	______
Total Expenses for the Month	$ ______

The total expenses for the month above is representative of the average total expenses per month in the current fiscal year of the Sun Textile Company.

Net Income

Net income is the amount of money a firm has after expenses have been paid. The amount left over is called the net income.

Ann will calculate the net income for the month based on the figures in Tasks I and II.

Task III

Transfer the following amounts from Tasks I and II:

Gross income for the month $______________

Total expenses for the month $______________

Net Income (= gross income less total expenses) $______________

Estimate the expected annual net income, based on this month's net income. $______________

What fraction of the gross income are the total expenses for the month (to the nearest common fraction)? ______________

What percent of the gross income are the total expenses for the month (convert the fraction from above)? ______________

* *

The Sun Textile president wants a current accounting of company assets (anything of monetary value owned by the business). Will Johnson, a bookkeeper, has prepared a statement of the company's current assets (cash, and things readily converted into cash) and of the company's fixed assets (things which would take time to convert to cash). Because Ann has the final responsibility for work done by her bookkeeper, and her own work, it is important that she pay close attention to all work produced.

Task IV

As Ann would, double-check the balance sheet following. If you find an error, circle it and pencil in the correct amount.

Sun Textile Company
Total Annual Assets

Current Assets		
Bank Account	$29,000.00	
Municipal Bonds	17,000.00	
Insurance (Cash Value)	31,200.00	
Merchandise in Stock	47,520.00	
Cash	474.00	
TOTAL CURRENT ASSETS		$125,194.00
Fixed Assets		
Equipment & Fixtures	$449,725.00	
Company-owned Cars	30,321.00	
TOTAL FIXED ASSETS		$479,046.00
TOTAL ASSETS		$604,240.00

Liabilities

Liabilities are the monies owed by a company in a given time period (e.g., week, month, year.)

No financial picture of a company is complete without calculating the company's liabilities. Ann has computed the annual liabilities for the current fiscal year so that she will be well prepared for an upcoming meeting with the company president.

Sun Textile Company
Total Annual Liabilities

Accounts Due	$ 2,700.00
FICA Taxes	8,095.00
TOTAL LIABILITIES	$

Task V

Now it is possible to calculate the net worth of the Sun Textile Company; that is, to calculate the difference between its total assets and its total liabilities.

Transfer the following amounts from Tasks IV and V:

Total assets (annual) $ ____________
Total liabilities (annual) $ ____________

Net Worth (= total assets less total expenses) $ ____________

* *

Personal Income Statement

This practice sheet is strictly for your own use and will not be discussed in class. Use your hand calculator to check your figures.

Income Statement
For the Month Ending ____________ ?

Money Received From:	Amount	
____________	$ ________	
____________	$ ________	
____________	$ ________	
____________	$ ________	
(A) Total: Money Received		$ ________
Money Spent On:		
____________	$ ________	
____________	$ ________	
____________	$ ________	
____________	$ ________	
____________	$ ________	
____________	$ ________	
(B) Total: Money Spent		$ ________
NET INCOME FOR THE MONTH (A - B)		$ ________

Module 1

Information for Instructors

Occupational Cluster: Business and Office
Occupation: Accountant

This information is designed to accompany the unit of exercises to help your students see the linkages between the four basic math operations they have been practicing and the world of work. Here, basic math skills are presented in a simulated work situation.

Because this is the students' first formal encounter with career-oriented math in this project, any background information you can give them relating to the occupation presented here will help them feel comfortable with this approach to math skills. Information in this section will help you provide background information for them. (See the sheet on page 88 entitled "Preparing to Be an Accountant.")

Encourage students to work independently or in small groups to check their work. The only information needed before students can begin is the fact that parentheses around a figure represent a loss and therefore must be subtracted (after all possible addition is performed). (See Task I.)

Answers and some additional commentary on each of the tasks follows in this background information section.

Task I

Total for the Month:	Imports	$65,756.00	
	Domestics	33,096.00	
	Notions	1,401.00	
Total Gross Income for the Month			$100,253.00
Estimated Gross Annual Income			$1,203,036.00

Task II

Stress that legibility is important in all kinds of work relating to the transcription of figures. Sloppy handwriting may lead to misinterpretation of figures recorded.

Depending on your availability or on class use of these materials, someone will have to act as bookkeeper for the purposes of orally presenting figures for Task II. It requires practice to transfer numbers heard rather than seen (as may occur over the telephone between offices, for example).

Figures for Task II

Telephone	$ 300.00
Light & Heat	412.00
Insurance	2,250.00
Car Expenses	204.00
Taxes	2,791.00
* Depreciation	15,791.00
Salaries	37,268.00
Supplies	579.00
Rent	12,794.00

You may wish to transfer these figures onto a card so that a student may be the bookkeeper.

TOTAL EXPENSES FOR THE MONTH	$ 72,389.00
ESTIMATED TOTAL EXPENSES (Annual)	$868,668.00

Task III

Since this task does not explicitly say "subtract," point out the key word in the problem, "less," which indicates the same operation.

Total Net Income	$ 27,864.00
Expected Annual Net Income	$334,368.00
Total Expenses Expressed as Fraction of Gross Income	3/4
Total Expenses Expressed as Percent of Gross Income	75% or 72%

Task IV

This accounting of assets does not include real-estate entries because the company rents its space (see Task II), but you might test students' understanding of the difference between current assets and fixed assets by asking them where such an entry would be cited.

---

* You might wish to further explain the term "depreciation" as a decline in the monetary value of facilities and equipment owned by a company due to wear or obsolescence. The term "fiscal year" may also be unfamiliar to students, but it might help to refer to their own fiscal year on which they pay taxes.

TOTAL CURRENT ASSETS	$125,194.00	(correct)
TOTAL FIXED ASSETS	$479,046.00	(incorrect)*
(should read)	$480,046.00	(failure to carry properly from hundreds column or improper entry into desk calculator)
TOTAL ASSETS (including correction above)	$605,240.00	

* N.B. Remember that when students transfer the Total Assets figure from Task IV above, they must transfer the corrected amount.

TOTAL LIABILITIES	$ 10,795.00
NET WORTH	$594,445.00

If students want to discuss their practice sheets, "Personal Income Statements," you may choose to brainstorm with them possible sources of income and sources money gets spent on.

Other Activities

Upon completion of the series of tasks, or at a point along the way, elicit class/group/individual comments regarding students' comfortableness with the application of math to this occupational area.

At the end, encourage students to explore job availability in the local area by examining the daily paper for want ads relating to opportunities in accounting.

Homework: Ask students to bring to class sample ads which describe

- qualifications sought
- job tasks
- salary

Have students calculate the mean (average) salary of comparable jobs.

Role Models

At prearranged times throughout the semester, women working in occupations pertinent to accounting and bookkeeping will be available to speak to your class. Brainstorm with your class some suitable questions to ask people in the accounting/bookkeeping field.

Preparing to Be an Accountant

The position of accountant may be above the aspirations and abilities of many of the project participants, but they should still be aware of the training and education needed to be employed in this field, both because it supplies information about their work environment and because it may contribute to a realistic view of the world of work. The following information is intended for your use--for sharing with individuals and groups according to their expressed interests and needs to know.

Aptitudes of an Accountant

- must enjoy working with others
- must enjoy detailed work
- must communicate clearly orally and in writing
- must be able to work under pressure
- must have an interest in business and finance
- must have organizational abilities
- must be patient and pleasant with clients
- must recognize that the computer is becoming increasingly important

General Duties

Accountants maintain systems of keeping records of a company's financial transactions, assets, and liabilities. They compile and analyze records, prepare special reports, design new systems of accounting, modify existing systems, and have final responsibility for the smooth running of department tasks.

There are specialty areas within the accounting field, such as:

- tax accountant
- auditor (examiner of records)
- cost accountant
- internal auditor
- budget accountant (future needs)
- systems analyst

Job Prospects

There is expected to be a continuing, growing need for accountants throughout the 1980's, with increasing importance placed on data-processing skills in this occupation. Pay and working conditions are generally attractive.

Work Environment

There is employment for accountants in all fields of the private and public sectors: businesses, government agencies, individuals.

Educational Preparation

A minimum requirement in today's job market is a Bachelor's degree with a major in accounting. This schooling need not be done on a full-time basis, as courses at junior colleges, technical schools, and universities are offered in the evening as well as during regular day sessions. Further study at the graduate level in accounting and related business subjects is desired by the bigger firms. A special designation one may see in want ads is "CPA," which stands for Certified Public Accountant. This means that an accountant has fulfilled the following requirements:

- is a university graduate
- has field experience
- has passed a special examination administered by the American Institute of Certified Public Accountants

Information about Accounting Careers

Write to:

American Society of Women Accountants

and

American Women's Society of Certified Public Accountants

both at: 327 S. Lasalle Street
Chicago, Illinois 60604

Module 2

Bookkeeper

Jeanette Marcoux is a bookkeeper who works for Ann Cheung, accountant at Sun Textile Company in Boston. Jeanette began working at Sun Textiles three years ago as a secretary and was promoted to bookkeeper because she expressed an interest in detailed work with numbers and showed her proficiency in handling financial records. She is presently attending a business school at night, taking an accounting course there.

It is Jeanette's responsibility to handle the Accounts Payable section of her company's finances, including employees' salaries, materials, and services (e.g., lights, heat).

The Accounts Receivable section of the bookkeeping duties is handled by Will Johnson, another capable employee who had worked on figures relative to warehouse inventory before he joined Jeanette in the accounting department.

In a typical day, Jeanette performs the following kinds of duties, usually with the aid of a calculator:

a. computes the wages of an hourly worker
b. computes the commission of sales representatives
c. balances her petty cash flow
d. checks figures prepared by others

Because she is a member of a small department, she shares responsibility for filing the many ledgers, papers, and bills which supply her with important figures. She may also answer the telephone and deal with other employees of the firm--especially on payday.

* *

Gross Earnings

Employees are paid for work performed on one of the following bases: hourly rate, salary, commission, and piecework. These are basic methods of computing a worker's gross income.

A worker earns either wages (e.g., production worker, laborer) or a salary (i.e., white-collar worker). Wages are generally calculated on an hourly basis, whereas a salary is a fixed rate per week (or month or year).

Today Jeanette has received the records necessary for her to draw up the paychecks for two types of workers in the Sun Textile Company. From the supervisor of the warehouse she has received the weekly records of three warehouse employees who are paid hourly wages. The manager of the sales department has sent her the commission records of his sales representatives.

Help her to complete these calculations today so that she can be free to work on a special report for her boss.

Task I

Compute the gross earnings of the three warehouse employees. Use the "Office Use Only" section of their Weekly Work Record to show your calculations.

> Note: Employees who are paid on an hourly basis by this company receive time-and-a-half for each hour over 40 hours worked per week.

SUN TEXTILES COMPANY WEEKLY WORK RECORD WEEK____

EMPLOYEE FRED JAMIESON

SOC.SEC.NO. 465-08-2099

Payment Method

[✓ H] S S&C C P

DAY	IN	OUT	TOTAL	OFFICE USE ONLY	
M	8:00	5:00		Total Hours Worked	
T	8:00	6:00		Overtime Hours	
W	8:00	5:00		Regular Rate	$3.00
Th	8:00	4:00		Overtime Rate	
F	8:00	6:00		Gross Pay	$
S				Signature	J. Marcoux

If this is a typical work pattern for Fred, estimate his monthly gross income.

$______________

SUN TEXTILES COMPANY WEEKLY WORK RECORD WEEK ________

EMPLOYEE BILL CHI

SOC.SEC.NO. 274·10·6812

Payment Method

[✓ H] S S&C C P

DAY	IN	OUT	TOTAL	OFFICE USE ONLY	
M	9:00	5:00		Total Hours Worked	
T	8:00	5:00		Overtime Hours	
W	9:00	5:00		Regular Rate	$3.40
Th	9:00	5:00		Overtime Rate	
F	8:00	5.00		Gross Pay	$
S				Signature	J. Marcouy

If this is a typical work pattern for Bill, estimate his monthly gross income. $ ________

SUN TEXTILES COMPANY WEEKLY WORK RECORD WEEK ________

EMPLOYEE SAM YUEN

SOC.SEC.NO. 199·03·5828

Payment Method

[✓ H] S S&C C P

DAY	IN	OUT	TOTAL	OFFICE USE ONLY	
M	8:00	6:00		Total Hours Worked	
T	8:00	5 00		Overtime Hours	
W	8:00	5.00		Regular Rate	$3.40
Th	8:00	6:00		Overtime Rate	
F	8:00	6:00		Gross Pay	$
S				Signature	J. Marcouy

If this is a typical work pattern for Sam, estimate his monthly gross income. $ ________

Sam and Bill are paid more than Fred because they have worked at Sun Textiles six months longer than he has. There is a promotion opportunity as assistant supervisor for one of these three men next month, and the supervisor must decide among them. If you were the supervisor and had records like these with which to make your decision, whom would you choose? Why?

____

____

____

What other factors, besides these time sheets, might an employer use in making a promotion decision of this sort?

____

____

____

Task II

Jeanette's weekly task of computing wages for the hourly workers of her company is not completed until she arrives at a net income figure. To find this sum, she must determine the deductions and subtract them from each employee's gross pay.

To complete this task, you need the following information. Consult the Income Tax and FICA Tables at the back of your text to determine deductions; all other deductions are voluntary on the part of the employee.

Fred Jamieson: married, 3 withholding allowances
Bill Chi: single, 1 withholding allowance
Sam Yuen: married, 4 withholding allowances

PAYROLL LOG

SOC. SEC. NO.	GROSS PAY	INC. TAX	FICA	INSURANCE	BONDS	NET PAY
965-08-2099				$5.00		
279-10-6812				5.00		
199-03-5828				5.00	$10.00	

There are five sales representatives who work for Sun Textiles, selling the company's fabrics and notions to retail and wholesale buyers. All sales staff are paid on a straight commission basis; that is, they do not draw a base salary and receive commission. Instead, they are paid a fixed percent of the individual's net sales.

Sharon Tam is a sales representative who earns a monthly commission. While Jeanette is working on the special report for Ann Cheung, you will be responsible for calculating the commission owed to Sharon.

Task III

To calculate Sharon's monthly commission, you will multiply the rate of commission (in this case 5%) and the amount of net sales.

First, convert the 5% commission rate to a decimal:_______

SUN TEXTILE COMPANY RECORD OF SALES MONTH ENDING__________

EMPLOYEE______________________________ Payment Method

SOC.SEC.NO.___________________________ H S S&C C P

BUYER	GROSS SALES	RETURNS (-)	NET SALES
Young Set Garments	$ 952.00		
Better Shirts Company	1,601.00		
Storkland, Inc.	810.00		
Filene's	7,971.00	$1,388.00	
Jordan Marsh	4,989.00	984.00	

NET SALES FOR THE MONTH $____________________

COMMISSION FOR THE MONTH $____________________ (gross income)

If this is an average month's sales pattern for Sharon, estimate her annual gross income. $_______________

On the next page is the monthly Payroll Log for the Sales Department showing Sharon's gross income and that of the four other sales representatives. Complete the log for all the sales representatives.

Note: All sales representatives are allowed a Travel Expense Account, so the amount that appears in the "Travel" column is added to their pay, not deducted. Calculate the FICA deduction at 5.85% of gross pay.

First, express 5.85% as a decimal:________

PAYROLL LOG

SOC. SEC. NO.	GROSS PAY	INC. TAX	FICA	INSURANCE	BONDS	TRAVEL(+)	NET INC.
037-24-1019		$112.00		$ 5.00	$5.00	$25.00	
973-28-7512	$584.32	64.60		10.00		27.25	
217-10-3265	601.97	49.40		10.00	5.00	34.75	
276-08-2143	731.32	88.60		15.00		23.00	
130-02-7736	543.79	80.50		5.00	5.00	23.50	

Sharon has been offered a job as the head of a department in a retail outlet to which she currently sells fabrics and notions. This large retail chain is offering her a guaranteed monthly salary of $400.00, a commission on personal net sales over $1,000.00 of 4%, and a commission on the net sales of other employees in her department of ½%. (This kind of commission is called an override.)

The department head who was promoted within the company averaged $3,000.00 monthly in personal net sales, while the net sales of the department averaged $17,000.00 monthly.

Task IV

Set up a table similar to that in your text (p. 162), and compute Sharon's expected monthly salary if she were to accept this job. Space is provided on this page.

SHARON TAM'S EXPECTED MONTHLY SALARY (GROSS INCOME)

From the information she has about gross income, which job is better for Sharon? ______________________________

By how much? $ __________

Before she makes a final decision, what other salary-related information should she have to make an informed decision? __________

____

____

List some other features about the new job that you would want to know if you were in Sharon's job. ____________________

____

____

* *

Petty Cash

> Every business has a need for a small amount of cash in the office to cover miscellaneous expenses such as stamps, emergency office supplies, or delivery of a package (C.O.D.), and so maintains a petty cash fund to cover these immediate needs.

Jeanette has to account monthly for the balance of the petty cash as she prepares her "Monthly Expense" figures. She keeps a petty cash balance of $50.00 on hand either in cash or in cash and receipts (to account for money paid out).

Task V

Last month she had the following notations in her petty cash notebook, and she needs to update her records. She sees this as an opportunity to keep her mental computation sharp, so she will perform the following tasks without computing on paper or by using her calculator. (Of course, she double-checks her work.)

1/2/78	C.O.D. parcel: fabric samples to President, Mr. Yen	$1.45
1/5/78	Stamps (50 x 13¢)--Will Johnson picked them up	6.50
1/9/78	Paid taxi for Ms. Cheung (personal)	5.25
1/19/78	RUSH parcels taken to post office by me	12.73
1/23/78	Ad placed in local paper for stenographer	10.00
1/26/78	Lunches for office staff paid by Mr. Yen	7.82

How much money does she have to collect from individuals for personal debts? $ __________

How much money should she be able to account for in business receipts?
$______________

How much money has been used in total from the petty cash this month?
$______________

Jeanette always maintains a minimum balance of $5.00 cash and then Will writes a check to return the balance to $50.00. How much more money can be dispensed before this happens this month? $______________

Module 2

Information for Instructors

Occupational Cluster: Business and Office
Occupation: Bookkeeper

While the "Accountant" unit was primarily designed for independent work by class members, this unit is for small-group or whole-class participation. (See Tasks I and IV.) That is, besides computational tasks, there are questions which ask the individual to imagine work contexts beyond the math duties of the day. It is here that the math instructor leaves the conventional role of conveyor of information and skills and enters a futuristic role as facilitator to assist in the clarification of the attitudes and values of the learner, as well as to attend to cognitive issues.

You may wish to clarify the terms "Accounts Payable" and "Accounts Receivable," introduced in the opening paragraphs of class materials. Emphasize these categories as ways to depict the flow of money in ("receivable") and out ("payable") of a company, perhaps by using an elementary diagram to illustrate your point. The "Accountant" unit can supply a more concrete context for your explanation of Accounts Payable. In this hypothetical company, Accounts Receivable come from the sale of fabrics and notions. Include the role of these products in generating income for the company in your diagram on monetary flow.

Task I

Indicate that students should include a one-hour lunch break in their tally of hours worked (e.g., 8:00 - 4:00 = a 7-hour day).

On the Weekly Work Record under "Payment Method" are the letters:

H S S&C C P standing for Hourly, Salary, Salary plus Commission, Commission Only, and Piecework, which are terms included in the section marked "Gross Earnings" on the student materials.

(Fred)	Total Hours Worked	41 (40 hrs @ $3.00)
	Overtime Hours	1 (1 hr @ $4.50)
	Gross Pay	$124.50
	Actual* Gross Monthly Pay	$498.00
(Bill)	Total Hours Worked	37 (37 hrs @ $3.40)
	Gross Pay	$125.80
	Actual* Gross Monthly Pay	$503.20
(Sam)	Total Hours Worked	43 (40 hrs @ $3.40)
	Overtime Hours	3 (3 hrs @ $5.10)
	Gross Pay	$151.30
	Actual* Gross Monthly Pay	$605.20

*Encourage students to use their estimation skills, not their calculators, to arrive at a figure here, and to share with one another the process(es) they used to arrive at their answer.

Promotion Question:

Assuming that these work records are typical of work performance by these three men (as the question suggests), Sam Yuen is probably the preferred candidate. He and Bill have seniority over Fred, and his work record indicates greater stability than either of the other two men (i.e., three extra hours and two regular workdays versus lateness and early departures in the records of the other two).

Factors in Promotion Question:

Be prepared to discuss unfair as well as fair criteria used to give promotions, but do not let this become a gripe session. Discussion of unfair practices can be turned into discussion of protection under the law (e.g., as outlined in the U.S. Department of Labor pamphlet "A Working Woman's Guide to Her Job Rights").

Fair Factors

- employee willingness to assume duties not hers/his according to a job description
- demonstration of positive work attitudes (e.g., punctuality, courtesy)
- thoroughness in performance of a task
- ability to conceptualize role of self in the larger work environment (i.e., fit of individual effort and the goals of a department or organization)
- demonstration of leadership qualities

Unfair Factors

- pressure by employer to have employees perform personal favors in return for implied rewards
- stereotyping of workers by age, sex, ethnic group, handicap, etc.

Task II

SOC. SEC. NO.	GROSS PAY	INC. TAX	FICA	INSURANCE	BONDS	NET PAY
965-08-2099	$124.50	$10.40	$7.28	$5.00		$101.82
279-10-6812	125.80	18.70	7.36	5.00		94.74
199-03-5828	151.30	13.30	8.85	5.00	$10.00	114.15

From Task I; figures for third and fourth columns from tables at back of text.

Task III

The 5% commission rate expressed as a decimal is .05.

Net Sales for the Month	$13,951.00	
Net Commission for the Month	697.55	(gross income)
Actual* Annual Gross Income	8,370.60	

---

*Here again, encourage use of estimating skills, not use of the calculator.

5.85% expressed as a decimal is .0585.

SOC.SEC.NO.	GROSS PAY	INC.TAX	FICA	INSURANCE	BONDS	TRAVEL(+)	NET PAY
037-24-1019 (Sharon)	$697.55 (above)	$112.00	$40.81	$5.00	$5.00	$25.00	$559.74
973-28-7512	584.32	64.60	34.18	10.00		27.25	502.79
217-10-3265	601.97	49.40	35.22	10.00	5.00	34.75	537.10
176-08-2143	731.32	88.60	42.78	15.00		23.00	607.94
130-02-7736	543.79	80.50	31.81	5.00	5.00	23.50	444.98

Task IV

Not all of the line entries on page 162 (text) are necessary here.

Personal Net Sales	$ 3,000.00
Sales Quota	1,000.00
Sales Subject to Commission	$ 2,000.00

Department Net Sales	$17,000.00	
Commission	2,000.00 x .04 =	$ 80.00
Override	17,000.00 x .005 =	85.00
Salary		400.00
Gross Monthly Income		$565.00

- Her present job is better if viewed only from the perspective of gross income
- By $132.55
- She should ask questions about or receive an employee package on such salary-related issues as:
  - travel allowance (which she presently has)
  - health plan
  - insurance plan
  - employee dividend plan
  - vacation time
  - retirement plan

- Other non-salary-related job features she might consider are:
  - scope and nature of new duties: as a department head, she will have supervisory duties. Does she aspire to this kind of administrative role?
  - comparative company policies relating to promotion and transfer, including the record of each company in promoting women into middle and upper management positions
  - distance to each job and available transportation

Task V

Encourage students to do this task in their heads. The figures are small and the questions straightforward.

Money for personal debts to be collected • Ms. Cheung, taxi • (The lunches paid for by the company president can be presumed to come from petty cash)	$ 5.25
Amount in receipts	38.50
Total amount used this month	$43.75
Amount still to be dispensed (i.e., to leave a $5.00 cash balance, she can only dispense up to $45.00)	$ 1.25

Preparing to Be a Bookkeeper

Some of the participants in this project already have positions as a bookkeeper or accounting clerk because these support positions are presently filled predominantly by women. (In 1972, 90% of the nation's bookkeepers were women.*) This situation is due in part to the fact that women have lacked appropriate training and education for accountant-level positions and in part to discriminatory personnel practices which have channeled women into these job areas.

Aptitudes of a Bookkeeper

- must enjoy detailed work
- must show an aptitude for working with numbers
- must write legibly
- must be able to organize and concentrate on a variety of tasks
- must be able to operate business machines competently

General Duties

A bookkeeper is typically one who carries out assigned accounting-related tasks: recording transactions in accounting ledgers, writing checks, and computing summary figures for the accountant to use in preparing composite reports. Increasingly, bookkeepers are expected to use adding machines or calculators with facility to speed completion of their tasks.

---

*Sarah Splaver, Non-Traditional Careers for Women (New York: Julian Messner, 1975), p. 173.

Job Prospects

Computers have taken over many of the functions of bookkeepers in large corporations so job growth in this area is not as great as in data-processing areas, where bookkeeping skills are still a requisite. While bookkeeping jobs will be available due to employee turnover and retirement, it should be recognized that transitions from bookkeeping to more responsible positions have traditionally been difficult unless the employee seeks further educational training. The best opportunities for bookkeepers in the future in terms of initial employment and promotion will come with the acquisition of computer-related skills.

Educational Preparation

Bookkeepers generally are high school graduates who have taken business courses in high school; e.g., business machines, typing, bookkeeping or accounting, business mathematics. Data-processing and computer programming skills are highly desirable for long-term employment, and may be studied at technical schools, junior colleges, and universities.

Information about Bookkeeping Careers

Write to:

United Business Schools Association
1730 M Street, N.W.
Washington, D.C. 20036

They will supply a national directory of private business schools.

Module 3

Bank Teller

Wilma Jackson is a bank teller in the Dorchester Home Savings Bank where she began as an interest clerk and was promoted to teller four months ago. She hopes to become a bank manager, but knows she must demonstrate a range of capabilities in order to be considered for further promotion. She knows that few women (14% in 1970) are bank officers so she must demonstrate a long-term commitment to her career goals in order to be a serious candidate. Completion of her degree, with a major in business administration, will be in her favor.

To make the transition from bank clerk to bank teller, Wilma went into a one-week training session conducted by the head teller who continues to supervise her. Wilma also receives on-the-job assistance after banking hours.

In a typical day, Wilma might perform the following duties:

a. handle withdrawals
b handle deposits for bank customers
c. help a customer to understand banking procedures better
d. prepare graphs to represent transactions

* *

Checking Accounts

Checking accounts are used by individuals and businesses to handle daily cash flow in the payment of bills. Checks are safer than cash; cancelled checks are considered legal receipts; and the customer receives a record of where and when her/his money was spent, so checking accounts are widely used.

Task I

This morning Wilma received the following checks from bank customers (see next page), and she must examine them first to make sure that customers have complied with banking rules.

Which of these checks did Wilma accept? Which did she void? (A void check is one on which an error has been made; it must be re-written--not merely corrected--to be accepted.)

CUSTOMER CHECKS

No. 8

Dorchester Home Savings Bank
Dorchester, MA 02124

March 29 1978

Pay to the Order of Donald McAlpine
~~New England Heat and Power Corp.~~ $ 51.32

Fifty-one dollars and ——— xx/100 Dollars

Note:
0110-0951-622-3991

Jack Ellison
Signature

Accept__________ or Void__________ (Check one; indicate error on check)

No. 12

Dorchester Home Savings Bank
Dorchester, MA 02124

March 30 1978

Pay to the Order of
Cash $ 75.00

Seventy-five dollars ——— xx/100 Dollars

Note:
0318-0695-531-7727

Susan B. Tubman
Signature

Accept__________ or Void__________ (Check one; indicate error on check)

No. 21

Dorchester Home Savings Bank
Dorchester, MA 02124

____________ 19____

Pay to the Order of
~~Jack Ellison~~ Jane Polk $ 212.97

Two hundred and twelve dollars and ——— 97/100 Dollars

Note: ~~car repair~~ rent
0424-0911-130-0884

Ralph Wright
Signature

Accept__________ or Void__________ (Check one; indicate error on check)

Task II

Assume that each check presented in Task I has now been accepted (void checks having been rewritten). Calculate the new balance of each of the following customers after the withdrawal transactions shown in Task I have occurred.

Note: A minimum balance of $100.00 must be maintained in the checking account of each depositor at this bank; otherwise, the bank charges a service charge of $1.25 per month for failure to maintain this minimum.

Jack Ellison	
Existing Balance	$768.12
New Balance (3/29/78)	
Susan Tubman	
Existing Balance	$579.42
New Balance (3/29/78)	
Ralph Wright	
Existing Balance	$258.90
New Balance (3/29/78)	

Task III

The same three customers deposited money in their checking accounts in the next two days. Calculate the new balance for these customers after the following deposits have been made.

Jack Ellison	
Existing Balance (3/29/78)	$
Deposit	184.42
Deposit	34.81
Deposit	17.68
New Balance (3/31/78)	
Susan Tubman	
Existing Balance (3/29/78)	$
Deposit	219.78
New Balance (3/31/78)	
Ralph Wright	
Existing Balance (3/29/78)	$
Deposit	153.21
New Balance (3/31/78)	

If each month Ralph Wright generally goes below the minimum balance allowed, estimate how much he pays in service charges per year.

$ ______________

Task IV

When Ralph Wright received his bank statement for the month of March, he discovered he had been charged a service charge because his balance went below the minimum balance allowed of $100.00. He has come into the bank to demand an explanation. Wilma has handled this customer complaint, and sees where the error is in his personal record keeping, but he must make the correction himself.

Insert corrections into his personal record so that it will agree with the bank statement at the end of the month.

CHECK NO.	DATE	CHECKS ISSUED TO or DESCRIPTION	(-) AMT/CH.	T	CH. FEE	(+) AMT DEP	BALANCE
							$320 71
288	3/10	Telephone bill	$ 19.61				301 10
289	3/13	Glad Rags--new jacket	61.41				239 69
	3/14	Deposit--Bill's check basketball tickets				$ 16.00	255 69
	3/17	Pay--deposit				153.21	408 90
290	3/27	Walter's Car Repair	250.00				158 90
	3/27	Birthday money--deposit				100.00	258 90
291	3/29	Jane Polk--rent	212.97				135 93
	3/31	Pay--deposit				153.21	289 14

Can you think of some constructive suggestions that Wilma might make to help Ralph maintain his account more accurately?

Task V

A lot of Wilma's work during her day involves working with and for people, as she did when helping Ralph Wright. She understands that most customers find banking practices complex, so she does her best to clarify and to help people to be more efficient in handling their own money.

Lizabeth Gunn has just opened her first checking account and has received her first bank statement. She is horrified to see that her personal record and the bank statement do not agree, so she has come to see Wilma about why this is so.

Bank Statement

> A bank statement is a computerized financial presentation prepared by the bank as a record of transactions in a given account for a period of one month.

It is not uncommon for a bank statement to disagree with the personal records maintained by a customer, because:

- checks written have not been cashed by other parties
- deposits made late in the month were not processed in time for the issuing of the statement
- service charges have not been calculated by the customer
- computational mistakes were made by the customer--or by the bank

Therefore, it is necessary to reconcile the bank statement (i.e., check the bank balance with the personal records balance). Most banks provide a form for this purpose on the back of the monthly bank statement, but anyone can set up his or her own on a piece of paper.

Using the model for reconciling a bank statement shown in your text (p. 301), lay out Liz's personal record and the Dorchester Home Savings Bank statement on this page.

Liz's bank statement for the period ending March 31 shows a balance of $519.38, while her personal record shows a balance of $416.21. A deposit unrecorded by the bank on March 31 was $124.76, and she had two outstanding checks for $195.79 and $33.54. There is also a service charge of $1.40.

Solution

Task VI

At the end of each day, each teller must count the cash on hand, balance the day's accounts, and sort out checks and deposit slips.

What is the total amount of cash on hand? Wilma has 2 x $100, 13 x $50, 40 x $20, 57 x $10, 163 x $5, 7 x $2, 317 x $1, and $39 in change.

$ ____________

She has checks for the following amounts: $51.75, $134.82, $961.02, $466.69, $78.82, $100.00, $91.44, $323.02, $220.51, $54.95, $24.25, $761.38, and $812.19. What amount of her day's transactions involved checks?

$ ____________

Task VII

At the end of each week, the bank prepares a statistical profile of the number of customers served. This week Wilma is preparing the graphs for the head teller, so she must collect the data and display them in graph form. (Use sections 16.6 - 16.8 of your text to assist you.)

Below are the data she collected from other tellers in order to show the deposit and withdrawal activity in the bank branch as a whole for each day of the week. Based on these data, prepare a bar graph showing deposit and withdrawal activity.

Use the graph paper provided.

TELLER	DEPOSITS					WITHDRAWALS				
	M	T	W	Th	F	M	T	W	Th	F
A	15	11	22	16	10	7	8	16	12	3
B	10	9	6	11	15	7	4	6	8	7
C	17	13	11	15	19	10	11	14	12	13
D	21	7	18	13	13	5	12	14	9	4
TOTAL										

Total Deposits = ____ Total Withdrawals = ____

Which day had the greatest number of deposits? ____________

Which day had the greatest number of withdrawals? ____________

What was the average number of deposits? ____________

What is the ratio of deposits to withdrawals? ____________

What percent of the total deposits for the week is Monday's total?______
Tuesday's?______ Wednesday's?______ Thursday's?______ Friday's?______
What percent of the total withdrawals for the week is Monday's total?______
Tuesday's?______ Wednesday's?______ Thursday's?______ Friday's?______

How would the same information on the week's activity of deposits and withdrawals look if Wilma put it on a line graph instead of a bar graph? Use the graph paper provided.

Task VIII

These have been sample math-related duties of a bank teller at the Dorchester Home Savings Bank, but the duties of a teller vary with the size and nature (e.g., savings versus all services) of the bank in question.

You may wish to ask a bank officer at your bank the following kinds of questions and share your findings with other class members.

1. What educational background is expected for someone desiring to be a teller in your bank?

____

____

2. Do you have an in-house training program to help someone move from clerk to teller? What does it involve?

____

____

3. What qualities and skills do you look for in an employee who is a good candidate for a bank officer?

____

____

____

____

4. Does your bank have specialized teller duties (e.g., note teller, handling loans; commercial savings; foreign exchange; payroll; discount; securities)?

____

____

Module 3

Information for Instructors

Occupational Cluster:	Marketing and Distribution
Occupation:	Bank Teller

This unit is built on the familiar role of the bank customer. The unit again mixes math problems with other kinds of problems (e.g., personnel or customer) which occur commonly in a work environment.

Task I

Check A--void	Written amount omits $\frac{32}{100}$, and therefore does not correlate with the numerical amount of $51.32
Check B--accept	
Check C--void	Date has been omitted

Task II

New balances (after transactions in Task I):
Note: These were all withdrawals.

	Jack Ellison	$768.12	
		- 51.32	
		$716.80	
	Susan Tubman	$579.42	
		75.00	
		$504.42	
	Ralph Wright	$258.90	
		212.97	
		$ 45.93	
Note:	Subtract	$ 45.93	
	service charge	- 1.25	(for not maintaining $100.00 minimum)
	here	$ 44.68	

Task III

New balances (as of transactions in Task II):

Jack Ellison	$716.80
	184.42
	34.81
	17.68
	$953.71

Susan Tubman	$504.42
	219.78
	$724.20
Ralph Wright	$ 44.68
	153.21
	$197.89

Ralph Wright pays exactly $15.00 per year in service charges ($1.25 x 12 months). In estimating this amount, students should note that 12 (months) = 10 + 2 months. Multiplying $1.25 x 10 = $12.50, just a matter of moving the decimal point, and $1.25 x 2 is then easily computed mentally. Encourage students to look for patterns like this when asked to estimate.

Task IV

CHECK NO.	DATE	CHECKS ISSUED TO or DESCRIPTION	(-) AMT/CH.	T	CH. FEE	(+) AMT DEP	BALANCE
							$320 71
288	3/10	Telephone bill	$ 19.61				301 10
289	3/13	Glad Rags--new jacket	61.41				239 69
	3/14	Deposit--Bill's check basketball tickets				$ 16.00	255 69
	3/17	Pay--deposit				153.21	408 90
290	3/27	Walter's Car Repair	250.00				158 90
	3/27	Birthday money--deposit				100.00	258 90
291	3/29	Jane Polk--rent	212.97				135 93
	3/31	Pay--deposit				153.21	289 14

45.93
199.14

Ralph's error was on the line for check #291. He subtracted incorrectly; his balance on that line should read $45.93, and the following line then becomes $199.14.

Since Ralph is a frequent offender in terms of going below the minimum balance allowed, it can probably be assumed that his computation skills are weak. It would be helpful for him to check his work

- by estimating what the new entry should be, as a way of finding large errors (like that of this month)
- by using a calculator to verify his work

Also, he should try to estimate his recurring monthly expenditures (e.g., rent, heat, etc.) so that he can better estimate how much money he has above payment for essentials to purchase items such as his jacket (see entry of 3/13, "Glad Rags").

Task V

	Bank Statement		Personal Record
Balance	$519.38		$416.21
Unrecorded Deposit	124.76		
	$644.14		
Outstanding Checks	$195.79	Service charge	$ 1.40
	33.54		
	$229.33		
	$644.14		$416.21
	-229.33		- 1.40
Adjusted Balance	$414.81		$414.81

Task VI

Total cash on hand is $3,405.00.
Total amount in checks is $4,080.84.

Task VII

An introduction to graphs--their purposes, their types, and the means of producing them--should precede work on this task. (See Chapter 16 of the text.)

TELLER	DEPOSITS					WITHDRAWALS				
	M	T	W	Th	F	M	T	W	Th	F
A	15	11	22	16	10	7	8	16	12	3
B	10	9	6	11	15	7	4	6	8	7
C	17	13	11	15	19	10	11	14	12	13
D	21	7	18	13	13	5	12	14	9	4
TOTAL	63	40	57	55	57	29	35	50	41	27

Total Deposits = 272　　Total Withdrawals = 182

The greatest number of deposits occurred on Monday.
The greatest number of withdrawals occurred on Wednesday.
The average number of deposits was 54 (54.4), or 272 ÷ 5.
The average number of withdrawals was 36 (36.4), or 182 ÷ 5.
The ratio of deposits to withdrawals is 1.5 : 1 (272 ÷ 182).
Percent: each day's deposits of the total week's deposits:

Monday: 23%
Tuesday: 15%
Wednesday: 21%
Thursday: 20%
Friday: 21%

Percent: each day's withdrawals of total week's withdrawals:

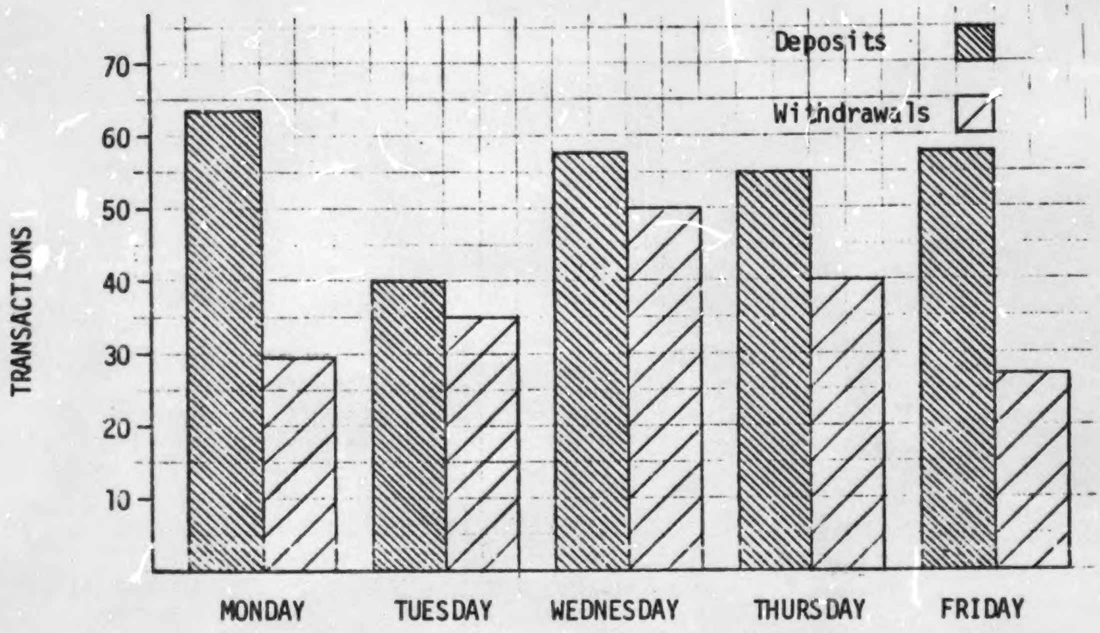
Monday:	16%
Tuesday:	19%
Wednesday:	27%
Thursday:	23%
Friday:	15%

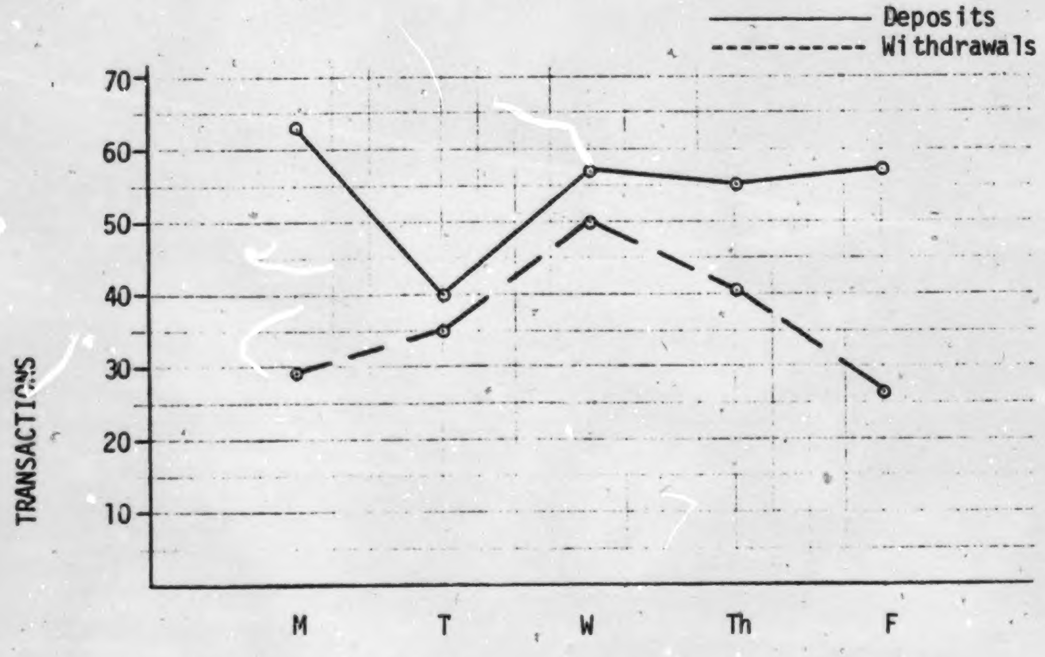
Bar graph and line graph are on the next page. Supply extra blank graph paper for each member of the class. Ask each person to use only one sheet for two graphs.

Task VIII

Encourage class members to complete this activity in their regular banking time and to share information gleaned with other class members at a future meeting.

Deposits and Withdrawals for the Week of ____________





Module 4

Engineering Lab Technician

Betty Flaherty is an engineering technician for Quality Control Labs, Inc. (QCL), a small, privately owned testing facility which checks the construction and/or performance of industrial parts and equipment of clients from business and industry.

QCL engineers design laboratory tests to check the efficiency and safety of parts and equipment ranging from electronic transistors to tires for earthmoving road equipment. Because clients contract with QCL for specific projects, there is a constantly changing array of products to be tested.

It is this variety of products that Betty finds challenging because offsetting this stimulation is the repetitive nature of her work as a quality control technician. She is responsible for administering repeated trials of tests on a sampling of a given product and for reporting the results of her tests to the engineer who originally designed the test.

Betty entered this engineering support field because she had enjoyed mathematics and science courses in high school and community college, particularly the application of scientific theory to practical problems. A career counselor at the community college suggested she enter a Bachelor of Engineering program, but she did not want to delay her entry to the work world so she took a technician's job instead. Now, two years later, QCL has offered to pay two-thirds of her tuition costs at a local university if she can maintain a B average in her engineering program.

Betty has demonstrated her capabilities as a technician on tasks which require her to:

a. read and handle scientific laboratory equipment
b. make accurate measurements in the metric system
c. report results accurately in graph, table and report form
d. handle simple descriptive statistics

This week, one of the industrial clients of QCL is a manufacturer of coil springs for sensitive laboratory equipment (e.g., scales). The client wishes QCL to verify that the four types of coil springs are reliable products. Using apparatus designed to measure the stretching capacity of the coil springs, Betty will submit sample springs to repeated trials and report her results to the engineer responsible for this project.

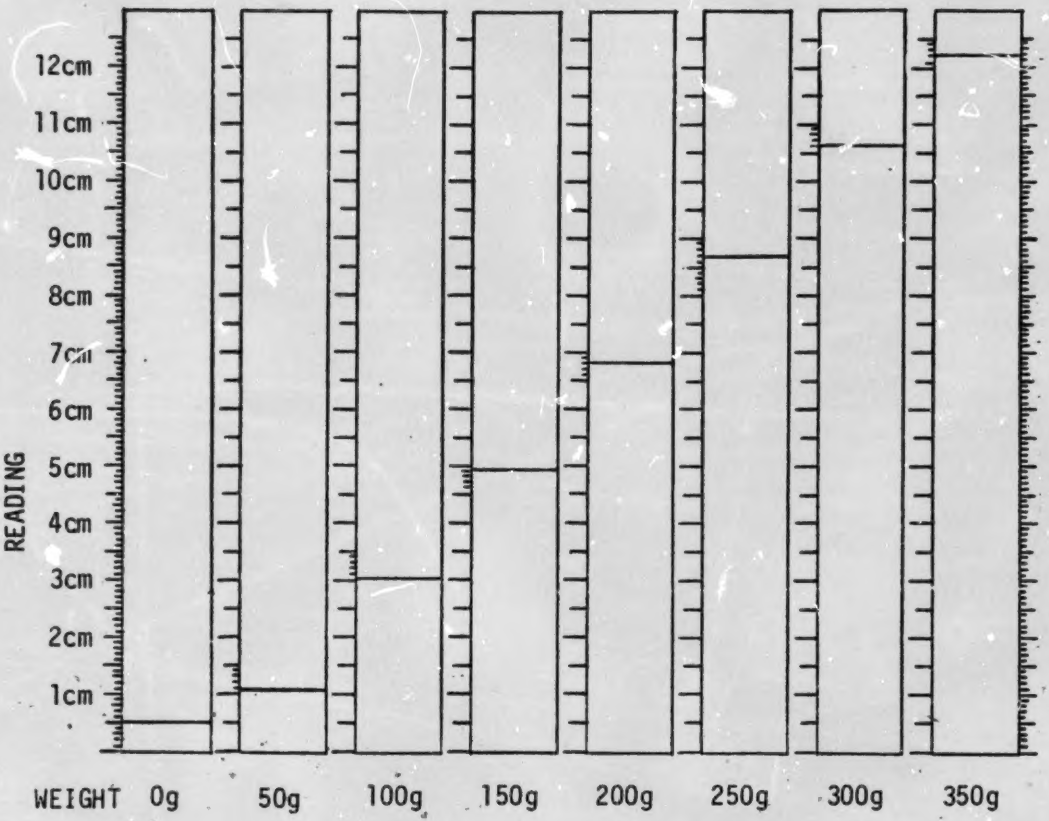
* *

Task I

To test the sample coil springs, Betty attaches a spring to a piece of lab apparatus which has a meter stick built into it. She then attaches a metric weight to the spring and takes a reading on the meter stick, which shows the point to which the spring has stretched. She adds another weight and takes a reading, and so forth.

Here is a series of readings Betty got from testing a sample of Coil Spring Type A-1. Read the markings on the meter stick carefully.

Type A-1



Transfer the numerical value of the eight readings of Coil Spring Type A-1 to the space provided below in the center column.

WEIGHT	READING	DIFFERENCE
0 g		
50		
100		
150		
200		
250		
300		
350		

(For Task II)

Task II

Having carefully read the effects of weights with constant increases on the stretch of Coil Spring Type A-1, Betty's next task is to calculate the arithmetic difference between two sequential readings.

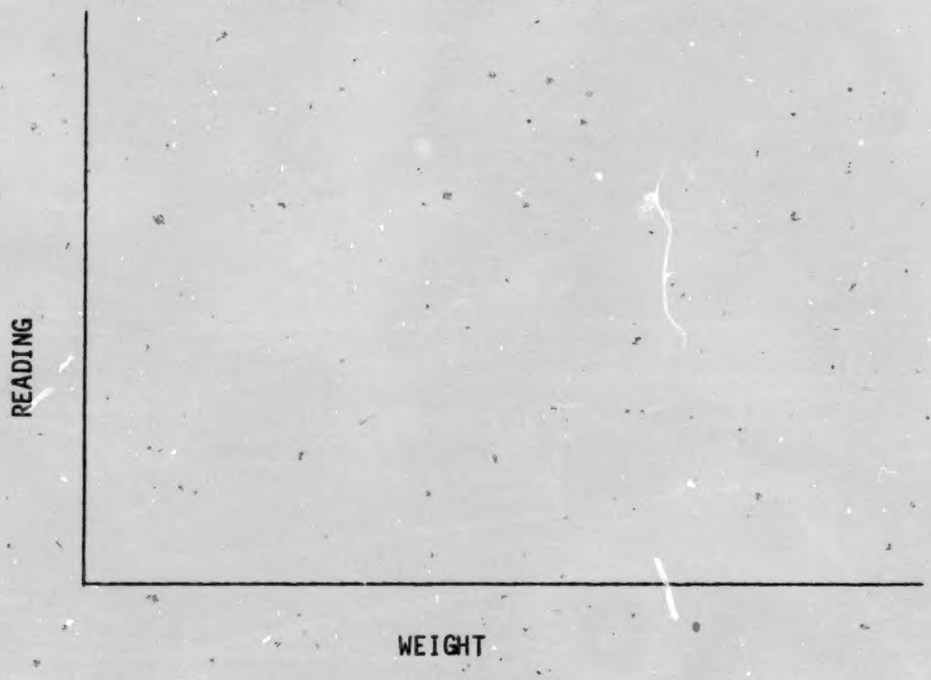
- Beside the readings you did in Task I, record the difference between each pair of sequential readings.
- What do you notice about the numbers you produced in this subtraction process?

* *

Task III

Betty often reports her data in graph form as well as table form. Use the space below to present the readings testing Coil Spring Type A-1. (Return to Task I for figures.)

Type A-1



- From this graph, what can you conclude about the way ideal test results would appear in graph form?

* *

Task IV

The industrial client for whom QCL is testing four types of coil springs is testing three new alloys. Coil Spring Type A-1 is the coil spring in current use; Types A-2, A-3, and A-4 are the same size, but of different metallic composition.

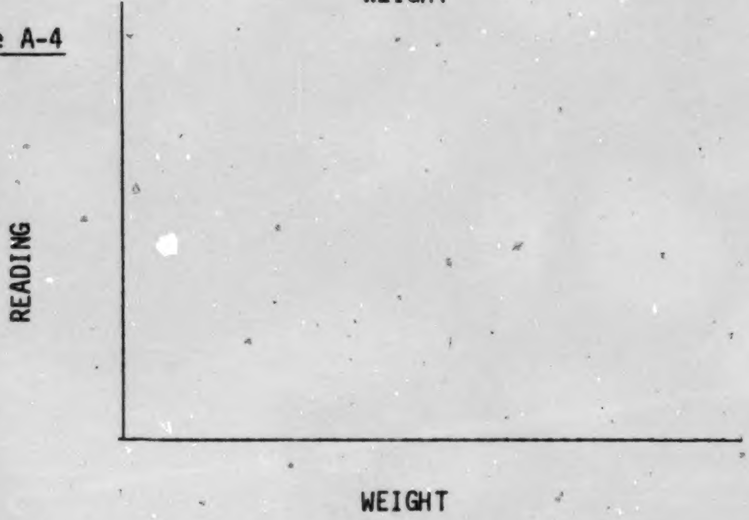
- From the readings presented here of these three test springs, plot the readings for each, and calculate the difference between readings.

	Type A-2		Type A-3		Type A-4	
	Reading	Difference	Reading	Difference	Reading	Difference
0g	0.4cm		1.5cm		0.5cm	
50	1.4		2.6		1.6	
100	3.0		4.0		3.0	
150	4.8		5.8		4.7	
200	6.6		7.6		6.8	
250	8.4		9.4		8.7	
300	10.2		10.9		10.6	
350	12.0		12.8		12.2	

Type A-2

Type A-3

Type A-4



Which of these three Coil Spring Types (A-2, A-3, A-4) most closely resembles Coil Spring Type A-1? Type______

Which of these three Types is likely to be most reliable, that is, to perform consistently? Type______

Which of these Types is likely to be least reliable? Type______

* *

Task V

Using weights of regular increments permits Betty to obtain data at regular intervals and to make informed estimates about other possible readings.

For Coil Spring Type A-1, what is the probable reading for a 125g weight?

______

For the same spring, what is the probable reading for a 275g weight?

______

For the same spring, what would be the probable reading for a 500g weight? ______

* *

Task VI

What is the mean measure of the readings of Coil Spring Types A-2, A-3, and A-4 for each reading from 150g to 300g?

	READING			
WEIGHT	A-2	A-3	A-4	MEAN
150g				
200g				
250g				
300g				

Note: Refer to your text regarding calculation of the mean (pp. 487-490) if you are having trouble.

Task VII

A competitor's coil spring yielded the following readings for the given weight:

WEIGHT	READING
0 g	0.5cm
100	3.5
150	5.0
250	8.0
300	9.5
350	11.0

Plot the readings on a graph.

What is the probable reading for a 50g weight?_______

What is the probable reading for a 200g weight?_______

Task VIII

Imagine that you are Betty Flaherty faced with the task of reporting procedure and results from comparative testing of Coil Spring Types A-1 through A-4. Write a technical memo in which you outline your work so that your boss has data to share with QCL's client.

MEMORANDUM

To:
From:
Date:
Re:

Module 4

Information for Instructors

Occupational Cluster: Related Technical Occupations
Occupation: Engineering Lab Technician

The technical area described here is one of many in a fast-growing technological society. Engineering and science technicians work in a host of contexts, including electronics, aeronautics, and air conditioning/heating/refrigeration industries. Regardless of the setting, technicians function as support personnel to engineers and scientists. They perform practical tasks and use sophisticated instruments and computing devices such as hand calculators. Because of strong Affirmative Action programs in these industries, women with strong math and science skills are encouraged to seek employment as technicians.

Task I

Set up demonstration apparatus to show the stretch of a spring when various weights are applied.

The eight readings are:

WEIGHT	READING
0 g	0.5cm
50	1.1
100	3.0
150	4.9
200	6.8
250	8.7
300	10.6
350	12.2

Note: Encourage accurate (versus fast) reading of the eight values.

Task II

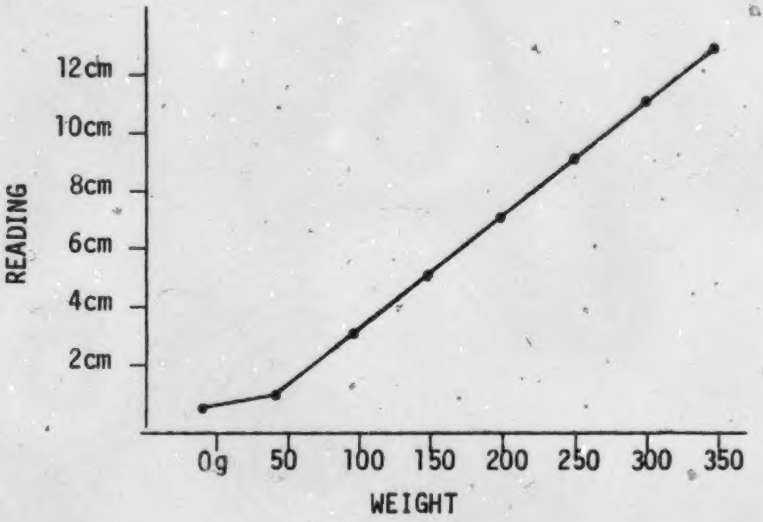
Note: The differences between readings are to be recorded in the right-hand column in the space provided for Task I in student modules.

READING	DIFFERENCE
0.5cm	
	0.6
1.1	
	1.9
3.0	
	1.9
4.9	
	1.9
6.8	
	1.9
8.7	
	1.9
10.6	
	1.6
12.2	

With the possible exception of minimum and maximum terminal values, the differences should remain constant (here: 1.9cm).

Task III

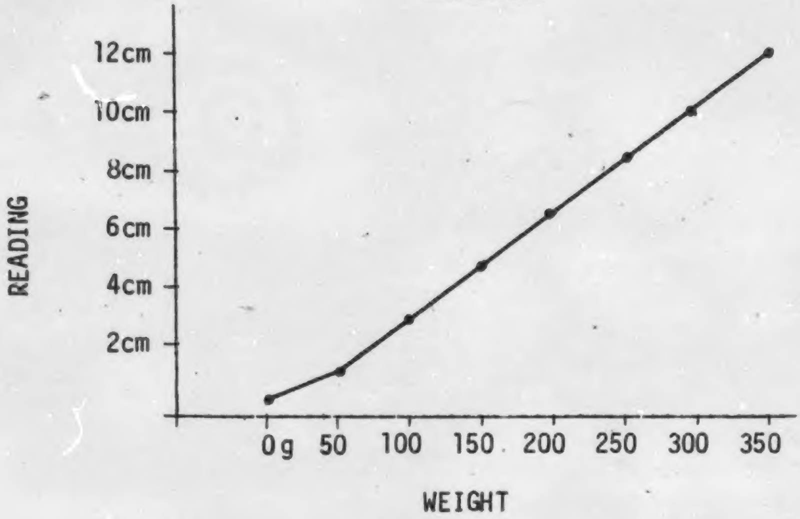
Type A-1



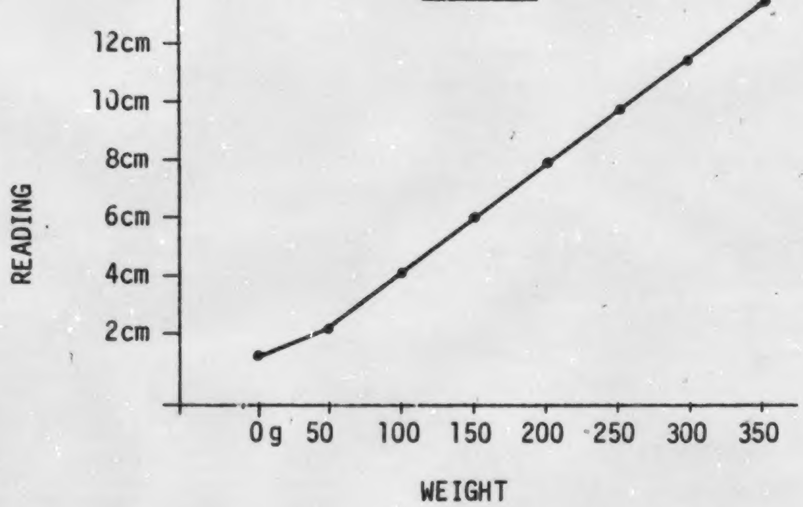
The ideal test results would graph as a straight line.

Task IV

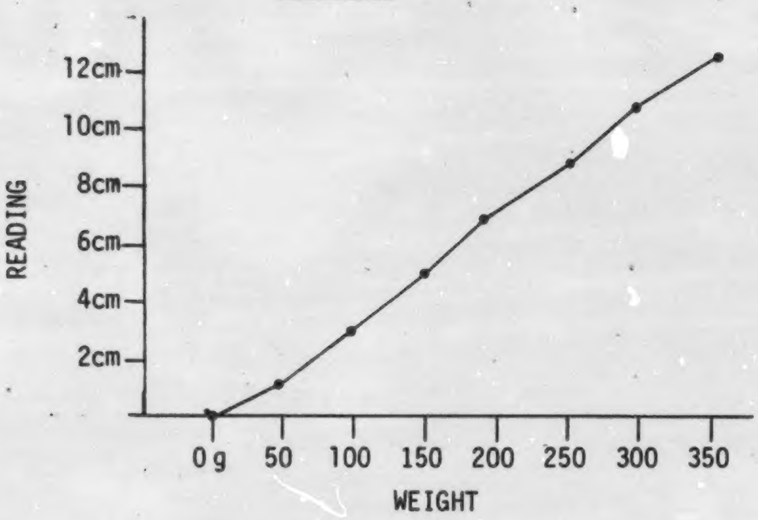
Type A-2



Type A-3



Type A-4



TYPE A-2	
READING	DIFFERENCE
0.4cm	
	1.0
1.4	
	1.6
3.0	
	1.8
4.8	
	1.8
6.6	
	1.8
8.4	
	1.8
10.2	
	1.8
12.0	

TYPE A-3	
READING	DIFFERENCE
1.5cm	
	1.1
2.6	
	1.4
4.0	
	1.8
5.8	
	1.8
7.6	
	1.8
9.4	
	1.5
10.9	
	1.9
12.8	

TYPE A-4	
READING	DIFFERENCE
0.5cm	
	1.1
1.6	
	1.4
3.0	
	1.7
4.7	
	2.1
6.8	
	1.9
8.7	
	1.9
10.6	
	1.6
12.2	

Spring Type A-2 most closely resembles Type A-1.

Spring Type A-2 is the most reliable of the three test springs.

Spring Type A-4 is likely to be the least reliable of the three test springs.

Task V

Other estimates besides those asked for in this task should be encouraged in this module (e.g., repeat questions for Types A-2 through A-4).

Type A-1

- The probable reading for a 125g weight is 3.95 (or 4.0, depending on rounding)
- The probable reading for a 275g weight is 9.65 (or 9.7, depending on rounding)
- Reasoning suggests probable reading for a 500g weight is 17.0, but very risky to estimate outside of the known range of values

Task VI

For weights from 150g to 300g inclusive of Coil Spring Types A-2, A-3, and A-4, the means are as follows:

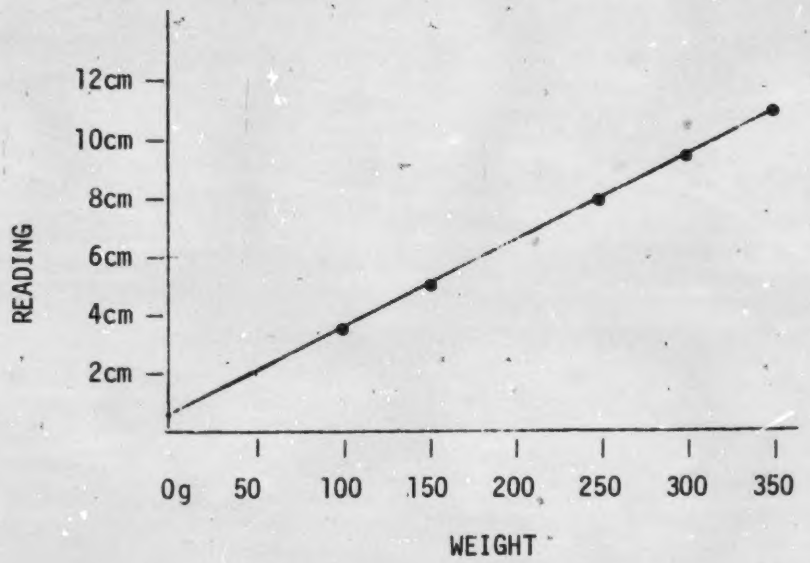
	READING			
WEIGHT	A-2	A-3	A-4	MEAN
150 g	4.8cm	5.8cm	4.7cm	5.1cm
200	6.6	7.6	6.8	7.0
250	8.4	9.4	8.7	8.8
300	10.2	10.9	10.6	10.6

Note: Values of these readings can be found in Task IV of student modules.

Task VII

The readings for a competitor's coil spring are as follows:

	WEIGHT	READING
	0g	0.5 cm
Not provided	50g	2.0
	100g	3.5
	150g	5.0
Not provided	200g	6.5
	250g	8.0
	300g	9.5
	350g	11.0



The probable reading for a 50g weight is 2.0 and for a 200g weight is 6.5 because the readings increase 3.0cm per 100g increment. Hence the readings increase 1.5cm per 50g increment.

Task VIII

In discussing or checking the statements prepared by class members, look for the following criteria: understanding

- that the initial readings are related to the measure of the stretch of the spring, and that these readings are plotted on a table
- that differences between these readings tend to be constant for some range of constantly increasing weights
- that this basic procedure is repeated with each spring type
- that the findings indicate Type A-2 is the most reliable spring, and A-4 is the least reliable

---

Note on Hooke's Law Apparatus: An inexpensive model may be purchased from Fisher Scientific Co., 1259 North Wood St., Chicago, Illinois 60622, or may be available in a public school science laboratory or through a teacher-training institution on loan.

Module 5

Pharmacy Assistant

Marta Hernandez is a pharmacy assistant at Veterans Memorial Hospital. She works in the hospital pharmacy under the supervision of a registered pharmacist whose responsibility it is to prepare sterile solutions, advise medical specialists on the selection and characteristics of drugs, and dispense prescriptions.

As pharmacy assistant, Marta performs tasks which help the pharmacist to complete his work. Marta also performs clerical tasks (e.g., filing invoices, entering prescriptions into a log book) and controls the inventory of drugs and chemical compounds kept in the pharmacy storeroom.

She came to her job from a high school program which had included mathematics and chemistry, as well as business education. At the hospital, she entered a three-month training program and is now considering an Associate Degree (two years) to become a registered technician.

Yesterday was a typical day for Marta. She had to demonstrate high attention to detail, accuracy, and conscientious work attitudes. Her tasks yesterday included:

a. assisting the pharmacist in the preparation of controlled substances
b. delivery of the substances to the appropriate nurses' station
c. assisting the pharmacist in the preparation of prescriptions for inpatients
d. processing prescriptions for outpatients
e. handling drug deliveries and purchase orders

All of Marta's work requires a sound understanding of the metric system because measurement in medicine is calculated in this international system. She must also understand a wide variety of medical and chemical terms, which she has acquired both from training and from her two-year experience.

* *

Task I

Careful measurement is a fundamental skill of the pharmacist in the preparation of drugs and solutions. This means close attention to the mathematical proportions in a given solution and to the act of mixing itself.

Yesterday the pharmacist was preparing a dextrose solution. He began with 6g of dextrose in 100ml of water but needed 10 l of a 6% dextrose solution. Following is how he obtained the solution needed.

Given: 6g in 100ml = 6 parts out of 100 (or 6%)

Required: to produce 10 l of a 6% solution.

Proof: 1 ml = .001 l
100 ml = 100 x .001 l = .1 l
multiply by 100 to get
= 100 x 6g in 100 x .1 l

Answer: = 600g in 10 l

or

Since 10 l = 10,000 ml

$$\frac{6g}{100\,ml} = \frac{x}{10{,}000\,ml}$$

$$100(x) = 6(10{,}000)$$

$$x = 600g$$

What did the pharmacist do in each of the following instances? Show your work in the space provided.

1. Had 5g of $NaHCO_3$ in 100 ml of dextrose; needed 1 liter of the same percentage.

2. 2g of salt in 100 ml of water yields a 2% saline solution. How many grams of salt are required to produce 30 l of the same percentage?

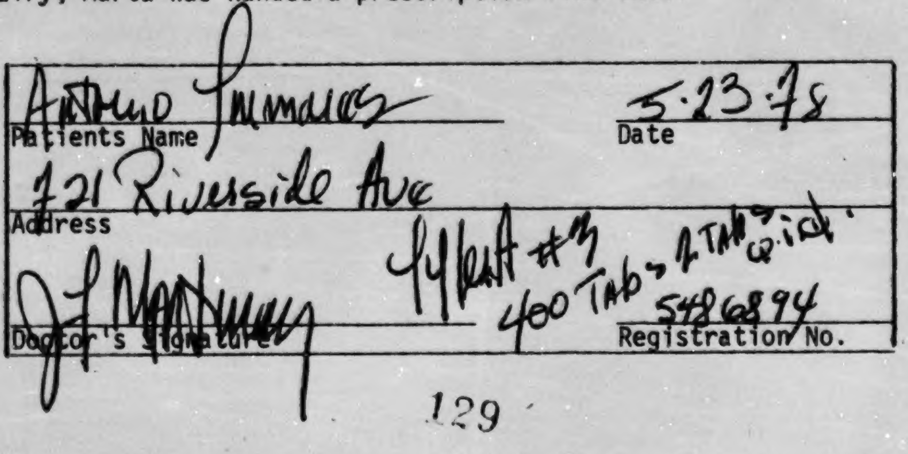
* *

Task II

Every day the pharmacist fills prescriptions for outpatients. Marta assists by getting appropriate supplies from the stockroom; typing the labels for the prescriptions' vials and bottles; and handling payment.

Yesterday an incident occurred which called for calm decision making on Marta's part because of the potential larceny involved.

While the pharmacist was in a nearby office handling a long-distance inquiry, Marta was handed a prescription like this.



Antonio Guimaraes
Patients Name

5.23.78
Date

721 Riverside Ave
Address

Tylenol #3
400 Tabs 2 Tabs q.i.d.

Doctor's Signature

5486894
Registration No.

Marta recognized this as a drug containing codeine, which is a narcotic. The maximum supply of a narcotic to be dispensed at one time is a month's supply (the specific number varying according to dosage).

In Mr. Sanmarcos' prescription, the letters q.i.d. stand for four times a day; that is, Dr. Martinez prescribed two tablets to be taken four times per day.

Based on this dosage, what is the maximum number of tablets that the pharmacist could prepare?________

How do you think Marta handled this situation?____________________________

____

____

* *

Task III

Every day nurses and doctors send prescriptions to the hospital pharmacy to be filled for inpatients. Marta prioritizes these orders according to their urgency, gives them to the pharmacist, and then records the prescriptions in her log book.

Information from medical staff comes to Marta in the following format:

Paul Granowsky, Rm 502
tetracycline capsules, 500mg
p.o. initially, then 250mg p.o. q.i.d.

To Marta, this means that the patient would receive 500mg, by mouth (p.o.) initially; then 250mg by mouth (p.o.) four times per day (q.i.d.).

Explain the following prescription briefly, such as was done above:

Thalia Iannou, Rm 346, diazepam
tablets, 15mg p.o. q.i.d.

____

____

Do the same for the following prescription:

Aaron Goldman, Rm 1302
aldomet, 250mg, 1 tablet
AM & 1 tab. PM

____

____

Task IV

The large quantity of drugs and chemical solutions used by a large hospital daily requires constant processing of orders which are delivered to Marta for unpacking and checking of the shipment. Marta reports the results of her work to the pharmacist.

Below is a description of the unpacking and checking process Marta uses.

She checks that:

- the box is sealed and undamaged
- it has been forwarded to the correct hospital and department by the shippers
- the packing slips agree with the drugs shipped
- the drugs inside are in good condition (i.e., still sealed, uncrushed, not leaking, etc.)
- the packing slip (if correct; see step 3) agrees with the original order in her files

In doing this work, careful handling and attention to detail are important work habits. It is not uncommon for Marta to be lifting and moving 10-20 pound boxes as she inventories drugs; and since one bottle of ergonovine tablets costs $400.00, one slip could be expensive.

Yesterday she discovered errors in the shipment of drugs from Larchmont Suppliers, Inc. Here is the hospital's original order and the supplier's packing slip placed with this company. Can you find the mistakes she reported to the pharmacist?

VETERANS MEMORIAL HOSPITAL

☐ PURCHASING DEPARTMENT

☐ MAINTENANCE

☐ BUILDING AND GROUNDS

NO: 702194

DATE: May 22, 1978

SHIP, ATTENTION: Marta Hernandez

TEL NO: 653-2901

DEPARTMENT: Pharmaceutical Services, 2nd Floor

DELIVERY ADDRESS: 6703 Connecticut Avenue

ACCOUNT TO BE CHARGED				ACCOUNT CODES TO BE CREDITED			
ITEM NO.	AMOUNT	DEPT.	ACCOUNT	ITEM NO.	AMOUNT	DEPT.	ACCOUNT
1-11		702	33-102				

	ITEM NO.	QUANTITY	DESCRIPTION	DATE REQUIRED
PURCHASE ORDER	1	2	Isordil, 10mg	5-31-78
	2	3	Synthroid, .025mg	5-31-78
	3	3	Keflex, 250mg	5-31-78
	4	1	Tylenol, 300mg	5-31-78
	5	2	Diamox, 250mg	5-31-78
	6	5	Serpasil, .10mg	5-31-78
	7	1	Premarin, 1.25mg	5-31-78
	8	2	Prednisone, 5mg	5-31-78
	9	1	Zyloprim, 100mg	5-31-78
	10	10	Digitoxin, .1mg	5-31-78
	11	2	Dynapin, 250mg	5-31-78

REQUESTED BY: ______________

TEL NO.: ______________

____
AUTHORIZED SIGNATURE

LARCHMONT, INC.

CUSTOMER ORDER NO: 702194 DATE: 5-26-78 FILE NO: A-704

SOLD TO

Veterans Memorial Hospital
6703 Connecticut Avenue
Boston, MA 01524

SHIP TO

Pharmaceutical Services, 2nd Floor
6703 Connecticut Avenue
Boston, MA 01624 ATTN: Marta Hernandez

PACKING SLIP

ITEM NO.	QUANTITY	DESCRIPTION
1	2	Isordil, 10mg
2	1	Synthroid, .20mg
3	5	Keflex, 250mg
4	1	Tylenol, 300mg
5	2	Diamox, 250mg
6	5	Serpasil, 1mg
7	1	Premarin, 1.25mg
8	2	Prednison, 50mg
9	1	Zyloprim, 100mg
10	10	Digitoxin, .15mg
11	2	Dynapin, 250mg

SPECIAL INSTRUCTIONS: **FRAGILE**

Module 5

Information for Instructors

Occupational Cluster: Related Technical Occupations
Occupation: Pharmacy Assistant

This unit is designed to accompany the text's Chapter 17, "The Metric System." Particular attention should be directed to the following sections: "Metric Prefixes" (Table 17.2), "Metric Abbreviations" (Table 17.3), "Measuring Weights" (Table 17.4), and "Volumes" (Table 17.5). Because few of the project participants use the metric system in their current jobs, the mathematics presented here is intentionally simple.

Task I

1. Given: 5g of $NaHCO_3$ is added to enough water to make 100ml of solution

Required: 1 liter of the same percentage

Proof: 1ml = .001 l
100ml = 100 x .001 l = .1 l
multiply by 10 to get
1 liter of solution
5g x 10 in 10 x 100ml
= 50g in 1,000ml
Answer: = 50g in 1 l

or

$$\frac{5g}{100ml} = \frac{x}{1,000ml}$$

$$100x = 5(1,000)$$

$$x = 50g$$

2. Given: 2g of salt in 100ml of water
Required: 1g of salt to produce 30l of same solution

Proof: 100ml = .1 l (see example 1)
multiply by 300 to get 30l of water
(i.e., 100ml x 10 = 1 l
1 l x 30 = 30 l)
300 x 2g in 300 x 100ml
= 600g in 30 l
Answer: = 600g of salt needed

or

Since 30 l = 30,000ml

$$\frac{2g}{100ml} = \frac{x}{30(1,000)ml}$$

$$100\ x = 2(30)1,000$$

$$x = 600g$$

Task II

Hospitals annually face enormous losses of drugs and narcotics through theft, so the possibility of an outpatient presenting a false prescription is by no means rare.

The maximum number of tablets allowable on this prescription is 248 (31 days maximum in month x 8 tablets per day).

It is important for students to understand that Marta is not authorized to proceed with filling or altering the prescription on her own. She might do one of the following:

- ask the patient to wait while she waits for the pharmacist to finish the long-distance phone call
- call the doctor who issued the prescription for clarification regarding his/her intention, and communicate the answer to the pharmacist

---

Task III

This task is to help students feel comfortable with medical language and abbreviations they would encounter on the job.

- Thalia Iannou should receive one 15mg diazepam tablet by mouth four times a day
- Aaron Goldman should receive one 250mg tablet of aldomet, once in the morning and once in the afternoon

---

Task IV

Attention to detail will reveal four errors in the filling of the original order by Larchmont Suppliers, Inc.

The four mistakes can be found in the company's packing slip.

Item		
2	Synthroid	was filled as .20mg, but .025 was ordered
3	Keflex	was ordered in 3 units (under "Quantity"), but was filled as 5
6	Serpasil	was ordered as .10mg, but filled as 1mg
10	Digitoxin	was ordered as .1mg, but filled as .15mg

Technical Vocabulary

Pharmacist	A professional scientist who deals in the dispensing of prescription drugs
Controlled Substance	A drug which is dispensed only by a pharmacist because of its potentially harmful qualities
Dextrose Solution	A type of sugar solution
$NaHCO_3$	A baking soda substance used to reduce or stabilize acid concentrations
Saline Solution	A salt solution
Narcotic	A controlled substance which may be physically or psychologically habit forming
p.o.	(Latin: per os) by mouth
q.i.d.	(Latin: quater in die) four times daily

Preparing to Be a Pharmacy Technician

There is a growing trend in pharmacy, as there is in other branches of medicine, to use professional personnel, like the pharmacist, for the most sophisticated tasks of the profession, and to delegate the more mechanical tasks to paramedical personnel. Hence, there is increasing interest in improving the caliber of support personnel--in this case, the pharmacy technician.

A survey developed by the Massachusetts College of Pharmacy and sent to over 400 hospitals in the six New England states revealed that hospitals employ an average of four technicians per hospital, that 80% of these technicians have high school educations, and that 71% of respondents favored further two-year training programs for technicians.

Contact Dr. Benjamin R. Hershenson, Assistant Dean and Director of the Division of Special Programs, at the Massachusetts College of Pharmacy for details regarding their planned two-year program for pharmacy technicians.

APPENDIX G
Counseling Workshops

COUNSELING WORKSHOP 1

Warming Up a Group

Introduction

For several class members, the Math Careers Program and its counseling component may be the first major commitments of personal time outside of the home in years. For others, taking this course may represent a tentative first look at self-improvement.

Regardless of the motive, there may be considerable initial anxiety. Moreover, some of the women will not have been in an environment composed exclusively of women, and so will bring to the class particular anxieties or myths about such a milieu.

Consequently, there is considerable importance attached to the issue of creating a positive climate (see page 15, "Orientation"), both through a conscious effort by the counselor to behave in an empathetic manner and through strategically designed exercises.

Goals

- To clarify what participants may expect from the counseling sessions
- To provide an opportunity for the "safe" sharing of personal information
- To initiate a problem-solving mechanism for the group

Activities

1. Open the workshop by clarifying the range and nature of counseling services provided under the auspices of the program. (Guidelines for this discussion are provided on page 15 under "Orientation.")
2. Introduce yourself personally and professionally. Your introduction should also cover topics the class will deal with in the warm-up exercise below. (Example: You may share an anecdote about how you decided to become a counselor.)
3. Warm-Up Exercise
   a. Ask group members to pair off, requesting that if two people know each other they do not sit together. This exercise is to get to know someone who is presently a stranger.
      Note: You should explain clearly the purpose and eventual outcome (a report-out) to the group at this point. (See step 4 on the next page.)
   b. In dyads, have one group member talk to the other about herself, disclosing biographical information relating to the following areas:
      i. what it was like growing up as a girl in the 1930's (or the 1940's, 1950's, 1960's)
      ii. her current single or family life status
      iii. her current avocational (hobby) or leisure-time interests
      iv. her current vocational interests and goals, including why she is taking this course
      v. any other topic of personal interest

   c. Ask the listener in the dyad to absorb the information attentively so that she may later tell the group about her new friend. The listener may ask questions primarily for clarification, but should not initiate commentary.
   d. Ask participants to reverse roles in the dyads so the second members can similarly talk about themselves.

4. Re-form the whole group, and organize a report-out of information and impressions.
   a. Ask the group to reconvene, with the two members of each dyad sitting in pairs in a circle.
   b. Assist the first dyad report-out in the following ways:
      i. ask one member of the dyad to stand behind the chair of her partner while talking
      ii. ask the person reporting to use the first-person point of view and begin, "My name is. . . (using the name of the person she is describing)
      iii. request that the summary be no longer than three minutes
      iv. have the other partner of the dyad then repeat the process, standing behind the chair of the person who has just reported
   c. Repeat this process around the group so that everyone hears the information gleaned by the dyads.
5. You should then make some concluding remarks which include compliments regarding the clarity of report-outs, interesting content, humor, or whatever may be appropriate.

Optional Activity

6. You may initiate a suggestion box for problem solving, explaining that when there is time in future workshops, you will pull a problem statement from the box to work on as a group.
   a. You might use the following example as a first-time activity for this workshop session.
      Example: At work my boss tends to treat me as though he expects me to do something wrong, even though I get my work done on time and am generally accurate. How can I get him to change his mind?
   b. Throw out the problem to the group as a whole, and lead an informal brainstorming session.
   c. Then ask each woman to write down a problem statement or work-related problem, asking only the description. Stress concrete examples if possible; ask the writer not to sign the statement.
      Note: Not all women may contribute at this point. Provide time in later workshops for new contributions to be added to the pool.
   d. Collect the folded pieces of paper, and place them in a shoe box for later use, thanking the group for their input.

COUNSELING WORKSHOP 2

Values Clarification in the Decision-Making Process

Introduction

Introduced and practiced as a means of achieving greater self-awareness and self-assessment, the values-clarification approach can help people to become:

> less apathetic, less flighty, less conforming as well as less over-dissenting. They are more jestful and energetic, more critical in their thinking, and more likely to follow through on decisions. (Simon, 1972, p. 20.)

The benefits which can accrue from the values-clarification approach are appropriate for the population served by this adult education program, as participants have clear implications for better personal and career planning.

Goals

- To have participants clarify their values
- To have participants see their values as the basis for a decision-making model

Activities

Use the worksheet, "Values Clarification," for all activities.

1. Have participants generate a list of ten values.
    a. Ask participants to think of ten things they value: abstract or concrete. You may supply a brief list or brainstorm a list with the group--e.g., security, independence, honesty, money, prestige. Have participants record their choices on the handout provided.
    b. Ask participants to rank (1 = most important, 10 = least important) the values they choose for themselves.
2. Have participants face a decision and weigh possible alternatives in the light of their values.
    a. Ask participants to think of an important decision they expect to face within the next three years. To help them choose an important decision-making point, ask them to consider any of the following questions:
        i. what can I do to make my life more satisfying?
        ii. what job should I take?
        iii. what courses should I take when I return to school?
        iv. as a woman re-entering the work world, what occupations should I consider?

    Ask participants to describe the decision on the handout provided.
    b. Ask participants to consider three alternative actions they could take, other than the decision they have made, and to list under the alternatives the values that would be satisfied by taking these alternative courses of action.

c. Ask participants to list three resources (people, places, materials) which may help them with the reality testing of their decision by providing further information or insights into their course of action.

Example: A relative is working in a group member's area of career interest;

OR

A social agency may be able to advise a re-entry group member about programs to assist her

OR

A reasonably priced paperback (Bolles, What Color Is Your Parachute?) may answer job-related concerns

3. You may bring the meeting to closure with some synthesizing remarks about values clarification and reality testing. You should mention the potential usefulness of this worksheet as a focal point for discussion in one-to-one counseling around the decision-making process.

Note: If the optional suggestion box for problem solving was initiated in Workshop 1 "Warming Up a Group," you may use extra time to have the group answer a problem or generate more ideas to be addressed later.

WORKSHEET: VALUES CLARIFICATION

1. List ten values important to you:	2. Rank these values in importance (1 = most, 10 = least):
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

3. Name a decision to be faced within three years: ____________________

____

____

4. List three alternative courses of action:

A. ____

____

B. ____

____

C. ____

____

5. Which values would be satisfied by these alternative courses of action?

   A. Values: ____________________

   ____

   ____

   B. Values: ____________________

   ____

   ____

   C. Values: ____________________

   ____

   ____

6. List three resources (people, agencies, materials) which will help you "test" the wisdom of your decision:

   A. ____________________

   B. ____________________

   C. ____________________

COUNSELING WORKSHOP 3

Decision Making

Introduction

> Decision making can be defined as a process in which a person selects from two or more possible choices. A decision is not required unless there is more than one course of action, alternative, or possibility to consider. (Gelatt et al, 1973, p. 2)

Part of gaining control over one's life is the ability to solve one's own problems insofar as one can bring purposeful strategies to bear on the problem. Learning a conscious model of decision making can assist one to feel this sense of personal control because the course of action taken is one of weighed choice.

A basic model of decision making consists of three parts: a) values clarification, b) reality testing, and c) risk taking. Workshop 2 dealt with values clarification and reality testing; this workshop will complete work on the decision-making model.

Goals

- To familiarize participants with the three-part decision-making model
- To have participants practice the conscious use of a decision-making model

Activities

1. Review the activities of the previous workshop, reiterating the intention of values clarification and of reality testing.
    a. Values clarification: judging which values one prizes, cherishes, or esteems for oneself.
    b. Reality testing: seeking information about the alternative courses of action one might take, and weighing alternative outcomes in terms of probability and desirability.

2. Introduce the third element of decision making: risk taking. Risk taking is choosing a strategy that weighs the risks involved and gauges the most satisfactory degree of risk to the individual.

3. Ask participants to re-examine the worksheet "Values Clarification," and re-evaluate the decision they made and the alternatives they chose in light of the following questions:
    a. What information do I have about the course of action (decision) I have made? About the alternatives I have chosen?
    b. How accurate and appropriate is the information?
    c. Can I rank the alternatives in terms of desirability and element of risk?
    d. Am I still comfortable with the first course of action I chose?

Note: Permit time for the group to re-examine their worksheets, record notes and rank-order notations as appropriate. The counselor may move among the group members as a resource person if it becomes apparent that some are stalled.

4. Hand out the worksheet, "Decision Making--A Case Study," and ask participants to divide into two groups to consider the case study from two angles:

   Group 1: If Constanzia were to decide that pursuing her career is more important than spending time with her family is in her personal values, what reality testing (information gathering) might she do to reach this decision? What are the risks of this decision?

   Group 2: If Constanzia were to decide that spending time with her family is more important than pursuing her career (values), what reality testing might lead her to this decision? What are the risks of this decision?

5. Ask the two groups to report out to one another describing Constanzia's decision-making process in terms of values, reality testing, and risk taking.

WORKSHEET: DECISION-MAKING--A CASE STUDY

Constanzia is a capable worker in a large corporation. Because she has demonstrated both interest in the company and tenacity in the completion of assigned work, she has risen quickly as a technician and has been made a supervisor of a small department. However, her boss has made it clear that in order to be considered for further pormotion, she must obtain more schooling. (She has completed high school.)

Because Constanzia desires a lifelong career, she is anxious to seek more education relating to business management. However, she also wishes to spend more time with her husband and her two sons, ages 8 and 11. Her husband feels she is away from the home a lot already, and fears that schooling would cause additional absenteeism. Moreover, she has no time at present to pursue personal hobbies, though her husband is an avid camper and wants the family to travel more.

COUNSELING WORKSHOP 4

Launching an Effective Job Hunt

Introduction

Too often, women who feel stalled in their careers or who wish to re-enter the work world lack adequate information and tools (such as a well-written resume) to launch an effective job hunt. They resort to reading the classified ads section of their daily papers. Dismayed by the few leads thus turned up, coupled with fear of rejection, women tend to remain underemployed. However, there are simple and practicable strategies which can be planned to make women more effective job hunters.

Goals

- To have participants practice the use of job-hunting tools (resume and employment application)
- To have participants plan follow-up strategies for an organized job hunt

Activities

1. Have participants prepare a brief resume of their professional experience.
    a. Elicit definitions from the group for the term "resume," so that a reasonably brief group definition may emerge.
    Example: Resume = a concise summary of one's skills, competencies, education, and appropriate life and work experiences.
    b. Ask the group if members have prepared a resume for themselves before. What was hardest to do? When did they last update it?
    c. Lead into the resume-writing activity by stressing the need to constantly update a resume and the need to revise a resume according to the job sought.
    d. To demonstrate the resume-writing process, ask a member of the group to volunteer to give an oral resume while you record the answers at the board in a resume format. You and the volunteer will use the worksheet, "Sample Traditional Resume," as an organizer while the group members watch the process.
    Note: If revealing one's work history seeem too threatening, you might suggest that someone create a fictional personality with a fictional history so that the group can still experience the "building" of a resume.
    e. Elicit comments from the group regarding wording (e.g., of the work objective) and layout, and handle general inquiries about the traditional resume.
    f. Using the information on the board from the volunteer member of the group, continue the oral interaction with the volunteer to demonstrate how to turn a traditional resume into a skills resume.
    g. Give the group time to complete the worksheet, "Sample Traditional Resume," on their own.
    h. Assign completion of a first draft of a skills resume for homework. Stress the need for rigorous self-analysis before a skills resume can be said to be an effective document.

2. Discuss employment application forms in terms of format and types of questions.
   a. Distribute three to five application blanks from different business and industry areas and ask the group to note commonalities.
   b. You should also mention the legal aspects of application forms--that is, what questions cannot appear on the form or later in the interview because of potential discriminatory action by the employer. (See Bolles, p. 166.)
   c. You might ask interested participants to obtain an application form from a business for whom they would care to work or from one near them. These volunteer members of the group may then use a completed application form as a discussion topic when they next meet with the counselor on a one-to-one basis.

3. Brainstorm approaches to searching for a job. The local papers are an incomplete file of available openings, so other strategies must be considered. The brainstormed list should include:
   - asking friends or relatives about jobs where they work
   - asking friends or relatives about job openings elsewhere
   - answering newspaper ads
   - using a private employment agency
   - answering ads in trade or professional publications
   - contacting an employer directly
   - using the state employment service
   - taking civil service tests to qualify for civil service openings
   - placing an ad in a newspaper or journal

4. Ask each group member to choose three strategies appropriate to their career areas and to record them on the back of their resume worksheets.

5. Ask each group member interested in planning an individualized job hunt to sign up for a one-to-one counseling session. The purpose of such a session will be to review the first draft of the skills resume, to go over a completed application form, and to plan a job-hunting strategy with input from you regarding resources to assist in the process.

Optional Activity: Suggestion Box for Problem Solving

You may remove a problem statement, and read it aloud to the group to elicit constructive input to help solve the (anonymous) participant's problem.

COUNSELING WORKSHOP 5

Women and Men in the World of Work--
Assertiveness in the Work Context

Introduction

Several research studies have demonstrated that women and men hold different beliefs about themselves and the other sex with respect to female and male competencies and work attitudes (Broverman et al.; Polk). A commonly shared perception by women and men is that appropriate behavior for women is passive, and supportive of male assertiveness, but that assertiveness in women is aggressiveness, hence inappropriate. Women need to understand this commonly held mythology, and need to practice assertive behavior that will be constructive to them and their work environment.

Goals

- To have participants differentiate among non-assertive, assertive, and aggressive behavior
- To have participants practice assertive behavior in contrast to either non-assertive or aggressive behaviors

Activities

1. Write the following definitions of non-assertiveness, assertiveness, and aggressiveness on a chalkboard so that group members can study the distinctions for the discussion that follows.
    a. Non-assertiveness: failing to stand up for one's rights, or doing so in an ineffective way. The goal of non-assertiveness is to appease or placate others.
    b. Assertiveness: standing up for one's rights without violating the rights of others. The goal of assertiveness is to reach a mutual solution through straightforward communication.
    c. Aggressiveness: standing up for one's rights without reagrd for the rights of other. The goal of aggressiveness is to win.
2. Ask group members to share examples they have seen of each kind of behavior, based on personal or work experience. You can record sample anecdotes under the appropriate heading, and then discuss with students what kinds of emotions are generated in each kind of exchange.
    a. How would you feel after you knew you had not been assertive enough?
    b. How would you feel after you had behaved assertively?
    c. How would you feel after you had behaved aggressively?
    d. Similarly, how would it feel to be the recipient of these kinds of behaviors--i.e., if someone spoke to you in the above three ways?
3. Present the following role-playing situation to the group and explain that they will be divided into groups of three to act out the situation.

   a. Read the role-play situation: "You are an administrative assistant to a highly placed male executive. He has asked you to get his coffee, pay his bills, and make personal arrangements for him. You do not believe these are legitimate duties of your job."
   b. Ask group members to number off in threes. The first three people (1-2-3) are a triad. Number one is the administrative assistant, number two is the male executive, and number three is an observer.
   c. Give the group ten minutes to act out the problem. The administrative assistant should be non-assertive. The observer should watch both role players and comment at the end regarding observed characteristics of the assistant's and executive's behavior. (Allow five minutes for the report of the observer.)
   d. Then have the group repeat the situation with the administrative assistant behaving assertively (five minutes) and the observer noting contrasts (and evaluating whether or not the assistant's behavior conforms to the definition presented earlier).

4. Have the triads remain together and role play another situation, with the roles shifted to other members of the triad.
   a. Read the role-play situation: "You are a female executive who has three men working for you in your division. Two of them cause no special management problems; but one of them, who is your age, clearly resents you. You have assigned him an important task, but he is balking at doing it and running behind schedule in its completion."
   b. This time, number three (formerly the observer) should play the female executive; number one is the male executive; and number two is the observer.
   c. Give the group ten minutes to act out the problem. The female executive should be aggressive. Again, the observer should be neutral during the role play, but should provide feedback after the role-play interaction.
   d. As in step 3 above, have participants repeat the role play for five minutes, with the female executive now practicing assertive behavior and the observer monitoring her attempts to do so. Encourage constructive feedback.

5. Call all group members together for a whole-group discussion of the role play, and have participants re-evaluate their perceptions of non-assertive, assertive, and aggressive behaviors.

COUNSELING WORKSHOP 6

Communication Skills in Interviews

Introduction

Although a prospective employee has presented facets of her/himself to an employer through a letter or telephone inquiry which precedes an interview, an interview is the "acid test" of effective communication.

Non-assertive or aggressive behavior will probably influence the interviewer, as unintentional nonverbal clues will, so the job candidate has much to control about his or her behavior. Analysis of effective and ineffective interview behavior and practice of effective communication will help prospective employees to present themselves better (Sitzmann and Gracia, 1977).

Goals

- To have participants analyze verbal and nonverbal behaviors which contribute to effective or ineffective communication
- To have participants practice effective communication in an assertive behavior model

Activities

1. Recall for participants the distinctions among non-assertive, assertive, and aggressive behaviors (from Workshop 5).
    a. Post the above three headings and ask participants to supply examples of nonverbal behavior characteristic of each category. ("Nonverbal" here includes elements of appearance, such as dress, hairdo, and makeup; and body posture, facial expressions, and hand movements.)

    Example: Non-assertive: downcast eyes; slumped shoulders.
    Assertive: steady eye contact; erect posture.
    Aggressive: steady eye contact or stare; leaning forward.

    b. Have participant volunteers demonstrate some nonverbal behaviors of these three categories, and from their demonstration have other participants generate more ideas from observation.

    Note: This can be a good warm-up exercise, so allow ample opportunity for volunteers to demonstrate specific nonverbal behaviors they can pantomime (without exaggeration).

    c. Discuss with participants how we "communicate" with others, and how others make assumptions about us based on these nonverbal behaviors.

2. Using these same three categories (non-assertive, assertive, and aggressive), ask participants to describe verbal behaviors which characterize each category. ("Verbal" here includes voice pitch, volume, tone, and frequency of hesitations.)

    Example: Non-assertive: quiet/inaudible volume; apologetic/defensive tone.
    Assertive: clear/audible volume; confident tone.
    Aggressive: loud volume; strident tone.

Repeat participant demonstrations, this time requesting that volunteers combine verbal and nonverbal behaviors in a consistently non-assertive, assertive, or aggressive manner for a short role play of a prospective employee at an interview. Ask other group members to note additional characteristic behaviors.

3. Encourage participants to reflect whether their behavior in an interview is non-assertive, assertive, or aggressive.
    a. Divide the group into triads--prospective employee, interviewer, and observer. Give the appropriate role on the "Role-Play Worksheet 1" to the participant taking that role, and ask each person to take a minute to learn the role.
    b. Announce that the role play will take about fifteen minutes, followed by a debriefing led by the observer.

4. Ask groups to re-form in order to work with other members of the group whom they have not met or talked with in workshop activities.

5. Re-form the whole group to share informally the learnings they gained from these role plays.

ROLE-PLAY WORKSHEET 1

Role 1
Prospective Employee

You are a recent graduate from a two-year business college who has a career interest in sales and marketing. You have applied to Digitronics, which has a trainee opening in their accounting department, because you need the business experience. You are not confident in your ability to perform in an area which is other than where you are headed; at the same time, however, this is a foot-in-the-door opportunity.

CUT HERE -

Role 2
Interviewer

You are a personnel officer of Digitronics and are looking for a trainee for your accounting department. The head accountant wants someone who will give a long-term commitment to the department, but you recognize that employees are often more beneficial to the company if they can demonstrate flexible skills. Therefore, you are torn between pressure from the accountant and your own intuitions.

CUT HERE -

Role 3
Observer

After the role play, be prepared to comment on the prospective employee's communication style.

- Was it predominantly non-assertive, assertive, or aggressive?
- What nonverbal and verbal behaviors led you to believe this?

How did the interviewer conduct herself?

- Was the tone of the interview cordial, neutral, or hostile?
- Did the interviewer ask effective questions to elicit good information?

ROLE-PLAY WORKSHEET 2

Role 1
Prospective Employee

You are a worker with a background in retail sales and inventory control. This experience has led you to apply for the job of manager of a small business which is owned by an absentee investor. The problem is that your resume clearly lacks "management" experience per se, though you have performed many management tasks. You will have to sell yourself as a qualified person.

CUT HERE -

Role 2
Interviewer

You are an employment agent hired by an absentee investor to find a manager for his small business. The owner-investor has not been satisfied with the past manager and has asked you to find an experienced person for the job. It is up to you, however, to define "experienced."

CUT HERE -

Role 3
Observer

After the role play, be prepared to comment on the prospective employee's communication style.

- Was it predominantly non-assertive, assertive, or aggressive?
- What nonverbal and verbal behaviors led you to believe this?

How did the interviewer conduct herself?

- Was the tone of the interview cordial, neutral, or hostile?
- Did the interviewer ask effective questions to elicit good information?

COUNSELING WORKSHOP 7

Obstacles to Achievement

Introduction

Part of the acculturation of American women has been to equate "power" with "male," thereby leaving "powerless" to women, as though power were "a finite group" (Howe, 1975, p. 131). This traditional female mindset sees powerlessness as a more or less natural state of affairs for women or, worse, unsolvable. Hence, for most women to seek satisfying goals is to encounter innumerable and seemingly unsurmountable obstacles.

Overcoming obstacles--real and imagined, concrete and abstract--requires the development and fostering of a problem-solving mindset on the part of women.

Goals

- To have participants assess the potency of obstacles between themselves and their goals
- To have participants develop action plans based on their analysis of obstacles

Activities

Have participants use concrete examples of their lives if some of them want to volunteer real information.

1. Brainstorm with the group what form obstacles to goal attainment may take.
   a. Ask the group to imagine or recall that something or someone stands between themselves and the attainment of an important personal or career goal. What might the obstacle(s) be (e.g., concrete or abstract; within or beyond your control; within you or environmental; due to others)?
   b. Encourage from participants a rapid generation of ideas, while you remain neutral. The list should include items which name obstacles belonging to the above categories--e.g., finances, time, motivation.
   Note: If participants have trouble getting started, ask them to jot down completions to a sentence such as: "I can get where I want to be if only__________"; or, "It would be easy to do what I want, except for __________." Share sentence completions.
2. Share a hypothetical case study and ask participants to analyze what is the obstacle(s) in the central character's path to her goal(s).
   a. Give participants a piece of paper with the following case study on it, and ask them to read it over, noting or underlining where they perceive obstacles.
   Example: Susan is a capable worker who manages a small staff in a prospering, middle-sized corporation. Her title is Department Manager. In another department performing the same duties is a man

whose title is Director of Departmental Affairs; he earns $4,000 more per year than Susan. Her one conversation with her boss about this inequity has not yielded any receptivity on his part to what she feels is an injustice.

b. Discuss the case study above. Encourage participants to recognize some of the complex interpersonal conflicts that are present in what otherwise may appear to be a simple obstacle (here, ostensibly, the boss).
c. Divide the group into two sub-groups to consider possible ways to deal with the obstacle(s) they have identified. Their task is to create an action plan for Susan.
d. Ask the two groups to report out to one another what action plan they feel would be appropriate.
e. In the event they have not considered protection of the law as a strategy, share with participants legal information from such sources as the U.S. Department of Labor's (Women's Bureau) pamphlet "Equal Pay for Equal Work."

3. Ask participants to transfer these problem-solving competencies to an obstacle they face.
   a. Give each participant a copy of the attached worksheet, to be filled in with the details of an obstacle they would feel comfortable discussing with another person.
   b. Give each participant time to complete her own sheet, then team up with another group member.
   c. In each dyad, have one member volunteer to explain the obstacle she faces and to elicit an opinion regarding whether or not her solution (outline of steps) appears to be constructive. When input has been received and incorporated, reverse the relationship in the dyad.

4. Re-form the whole group for debriefing.
   a. Was it useful to hear another person's perspective?
   b. What new way of looking at the problem was useful?

   Note: It is important that the women understand that many obstacles are real, and not shortcomings on their part.

WORKSHEET: OBSTACLES TO ACHIEVEMENT

1. A personal (or career) goal that I would like to reach is:

____

____

____

2. An obstacle (obstacles) I face in pursuing this goal is (are) (list or describe):

____

____

____

3. I think I can remove (or work around) the obstacle(s) by doing the following (outline the steps you might take):

   a. ____________________________________

   b. ____________________________________

   c. ____________________________________

   d. ____________________________________

   e. ____________________________________

COUNSELING WORKSHOP 8

Providing Closure

Introduction

Having spent sixteen weeks together, the women in this course are likely to experience some anxiety and/or depression about its termination. Social relationships will have been formed by this point, providing some carry-over for the women, but the regularity of weekly one-to-one sessions with you the counselor, and the biweekly workshops, will be missed. It is your responsibility as counselor to assist the women to cope with program termination.

Goals

- To share group feelings about participants' experiences during the program
- To reassess individual career goals in the light of program experience
- To provide problem-solving suggestions for individual concerns

Note: This workshop can provide valuable informal evaluative data to you. If feasible, you should arrange to set up an audio-tape recorder in an unobtrusive location for the purposes of data collection. You may explain its presence as a way of capturing feedback, but should otherwise ignore its presence.

Activities

1. With the group seated in a circle, lead a values-clarification "whip"; that is, ask each woman in turn to respond spontaneously to such sentence stems as:
   a. A highlight of this math program has been. . .
   b. What I have enjoyed most about our group counseling workshops has been. . .
   c. I will miss. . .

   You should make no encouraging or critical comments and should intrude only to move the "whip" from speaker to speaker.

2. Lead a discussion with the group about their current career or specific job-related goals.
   a. Ask the group to consider whether they have altered, added, or dropped any important career or job goal that they had entered the program with sixteen weeks earlier.
   b. Then ask for volunteers (since not all women will have changed their goals) to describe what goal(s) they changed and why. This open sharing will provide an opportunity for women in the group to hear about the decision-making process of others and for you to provide positive reinforcement of sound decision making.
   c. Encourage group members to question a volunteer regarding the latter's decision-making process and to provide encouragement for their peers.
   d. You may repeat this process (2a-c), this time asking for volunteers to describe why they have maintained a goal they entered the program with. Here, too, the interest of the group should be focused on the decision-making process.

3. Using the suggestion box for a problem-solving mechanism, as introduced in the first workshop, ask each group member to write on a piece of paper a problem relating to the termination of the program that she would like you and/or the group to respond to (e.g., "I will miss the social contacts of this group," or "I need more math practice before I am ready for a college course"). You should provide uniform slips of paper to ensure anonymity.
    a. Having placed the problem statements in a shoe box, choose one at random and read it aloud to the group.
    b. Then ask the group to help this person solve this specific problem, offering ideas, people's names, resources, agencies, etc., as constructive input. The only rule is that any vocalized input must be problem-solving oriented.

    Be alert for a problem posed that is too difficult for this problem-solving strategy. In this event, if the group has no input to offer, you should be prepared to offer your services after the workshop on a one-to-one basis.

Optional Activity

If you desire more formal feedback, distribute a short questionnaire at this point, asking questions such as:

a. What was your favorite group workshop? Why?
b. Which workshop did you least enjoy? Why?
c. How would you rate the usefulness of your one-to-one sessions with me (1 = very high; 3 = neutral; 5 = very low)?

4. Be prepared to allow a brief period for socializing and saying goodbye. A small party might be planned beforehand to mark the last workshop; if so, the activities as outlined here should not consume the total time of the session.